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Program Standards for Establishing High Quality Postsecondary Trade and Industrial Education Programs

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PROGRAM STANDARDS FOR ESTABLISHING HIGH QUALITY POSTSECONDARY TRADE AND INDUSTRIAL EDUCATION PROGRAMS

by

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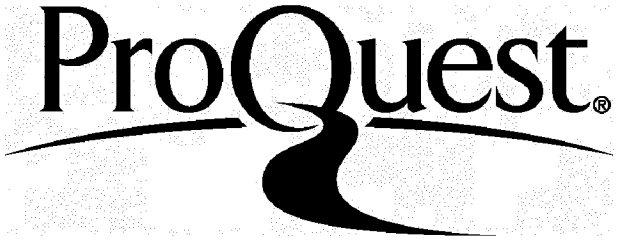

ABSTRACT

PROGRAM STANDARDS FOR ESTABLISHING HIGH QUALITY POSTSECONDARY TRADE AND INDUSTRIAL EDUCATION PROGRAMS

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The problem of this study was to develop standards that can be used as a basis for establishing high quality postsecondary trade and industrial education programs. There were two research objectives. These included: developing a set of program standards to be used to establish high quality postsecondary trade and industrial education programs and developing descriptors that can be used to assess achievement of high quality postsecondary trade and industrial education programs.

The Delphi technique was chosen for this study to generate consensus regarding the program standards. The panel of experts, comprised of postsecondary administrators of trade and industrial programs, was used to determine which program standards should guide the development and assessment of high quality trade and industrial education programs.

Four rounds of surveys were conducted, which resulted in a list of 17 standards with their related descriptions. The standards included Academic Integration, Advisory Committee, Curriculum, Employer Feedback, Faculty Qualifications, Meaningful Employment, Placement Rates, Program Design, Program Review, Safety, Soft Skills, Student Achievement of Industry Credentials, Student Assessment, Student Advancement, Student Remediation, and Tools and Equipment. Postsecondary administrators can use the results of the study to assess existing trade and industrial

education programs. The results can also be used to guide the design of new programs that meet industry labor needs.

DEDICATION

This dissertation is dedicated my wife Jen and my children Zach and Allie. Thank you for your support and patience throughout my degree. This would not have been possible without you. I love you all.

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There are several people who helped me successfully complete my dissertation that I would like to recognize. To Dr. John Ritz, my committee chair and advisor, thank you for your advice and guidance during my time in your program. You have helped me grow as an academic leader and as a person. To Dr. Michael Kosloski, thank you for your candid feedback and your willingness to answer my many questions. Your patience with me was greatly appreciated. To Dr. Dana Burnett, thank you for your input to the process. Your comments and advice have made this study stronger.

Beno Rubin

TABLE OF CONTENTS

Page

LIST OF TABLES

CHAPTER I

INTRODUCTION

The need for a skilled labor force has become more apparent in today's economy. Postsecondary educational institutions, such as community colleges, have been tasked with preparing the current and future mid-skilled workforce (Bragg, 2001). While some researchers have indicated that career and technical education (CTE) students have labor market advantages, others such as Bailey, Kienzl, and Marcotte (2004) argue that many students pursue a baccalaureate degree because they believe high school CTE programs restrict their earning power compared to graduates of college. Additionally, secondary CTE students are often targeted as "non-college" bound (Jacobs, 2001). However, many college graduates must go back to school to retrain for a technical skill in order to pursue a career (Grubb, 1996). The four-year degree does not always guarantee a job, and these graduates find themselves in debt due to the student loans required to obtain their degrees. Some four-year college graduates return to community college CTE programs to receive training and increase their earning potential (Symonds, Schwartz, & Ferguson, 2011).

In secondary education, skilled trades do not appeal to many high school students or their parents (Canadian Apprenticeship Forum, 2005). Additionally, many high schools focus on academic testing rather than CTE instruction as some school administrators have difficulty understanding how CTE can positively contribute to achieving the goals of high stakes testing in core academic areas (Chadd & Drage, 2006).

In the 21st century, there has been greater emphasis placed on high school career preparation programs as businesses look to update the skills of their prospective workers in an effort to stay current with changing trends in industry (Dougherty & Bakia, 2000).

Additionally, service-based industries contribute greatly to the economies of nations (Abeysekera, 2006). The combination of industry requirements for skilled labor and individuals seeking employment or retraining, creates a climate in which postsecondary institutions can take a lead role in providing the necessary training. Postsecondary education institutions are not taking the place of high school trade and industrial education programs. They are providing the necessary training for highly specific, industry credentials and technical skill development for new and incumbent workers (Jacobs, 2001).

Postsecondary institutions, particularly community colleges, are in an advantageous position to offer the training that industry requires while addressing changing economic needs (Wismer, 1994). Developing programs that continue to directly address industry's evolving needs will create new pathways for those seeking employment. This will also help individuals become productive members of the workforce, which will not only benefit industry, but also the local economy.

The nation's political, economic, and industrial climate changes have brought renewed interest in trade and industrial education. In 2001, Jacobs reported the results of a meeting between community college administrators and practitioners at which the direction of postsecondary occupational education was debated. There were two main outcomes from this meeting. First, the core mission of the community college vocational program is to prepare students for the world of work. Second, the design concepts of vocational education had become outdated. The recommendation for educational leaders of postsecondary institutions was to maintain ties with secondary schools so that a pathway to postsecondary education is available and to understand the importance of college completion. He concluded that vocational education leaders must "understand

their roles in the development of human capital" (p. 201).

The question that arises from this discussion is: How does industry ensure that schools are providing workers who can perform in the workplace? Many K-12 educational programs are required by law to meet state standards for student achievement. Postsecondary institutions must also meet accrediting agency standards. However, program standards for postsecondary trade and industrial programs can vary amongst the different programs, if they exist at all. Program standards could help trade and industrial programs by providing a framework for program design and assessment. Training programs that meet agreed upon standards, as a result of evaluation processes that involve industry, could ensure programs that are of high quality and which develop skilled workers needed by employers.

This study was designed to identify standards for designing and assessing postsecondary trade and industrial education programs. Once these standards have been established, institutions can use them to develop and assess their programs and thus improve the delivery of trade and industrial education.

Statement of the Problem

The problem of this study was to develop standards that can be used as a basis for establishing high quality postsecondary trade and industrial education programs.

Research Objectives

The research objectives that were used to guide this research study were:

RO_1: Develop a set of program standards to be used to establish high quality postsecondary trade and industrial education programs.

RO_2: Develop descriptors that can be used to assess achievement of high quality postsecondary trade and industrial education programs.

Background and Significance

The need to have program standards for trade and industrial education is not a new idea. Educational programs undergo assessments at various levels, using standards to benchmark agreed upon criteria for providing sound education or training results. With the passage of the 1968 Vocational Education Amendments, evaluation became a mandatory part of the states' responsibility of ensuring positive outcomes of secondary and postsecondary occupational education programs (Wentling, 1980). The Vocational Education Amendment of 1976 created stronger evaluation guidelines, which required vocational education programs to report on the ability of their students to obtain employment and measure the quality of their training by employers (McCaslin & Headley, 1993).

Other federal government initiatives have established training standards. The Job Training Partnership Act of 1982 required the use of performance measures and standards such as placement and retention in unsubsidized programs, earnings, and reductions in public assistance, in order to determine the effectiveness of an employment and training program. The Carl D. Perkins Vocational and Applied Technology Education Act of 1990 reinforced the use of standards as school systems revised their evaluation methods. This Act required states to develop core standards and performance measures for secondary and postsecondary vocational programs that measure learning to include achievement of basic and advanced academic skills, competency attainment, job or work skill attainment, retention or completion of secondary school, placement into additional training or education, incentives for targeted populations such as students with special needs, and procedures for utilizing resources developed in other federally assisted programs (McCaslin & Headley, 1993).

In 1983, the National Automotive Technicians Education Foundation (NATEF) developed a set of standards that outlined not only curriculum standards, but program standards as well (Lundquist, 2000). These standards defined how secondary and postsecondary automotive technology programs meet industry standards (National Automotive Technicians Education Foundation, 2012). As shown in Table 1, the guidelines provide performance indicators from which an evaluation team could determine how successfully the standards were implemented.

Table 1

NATEF Standards and Indicators

Standard Number	Standard Name	Indicators
1	Purpose	Employment potential from annual surveys
		Program description for brochures and catalogs
2	Administration	Student competency certificate
		Organizational chart
		Letter of support from administration
		Copy of written school policies
		Documented method of process for customer vehicles
		Policies and procedures that verify school's compliance with legal requirements
		Written first aid policy
3	Learning Resources	CD or online access to electronic service information
		List of all technology available for student and faculty use

Table 1 (*continued*)

Standard Number	Standard Name	Indicators
3	Learning Resources (*continued*)	List and location of technical automotive periodicals
		Examples of textbooks and other materials used for instruction
4	Finances	Description of the budget preparation process
		Advisory committee minutes that reflect budget discussions
		Budget requests and reports
5	Student Services	Policy statement describing the process for learning assessment
		Program information on learning assessment
		Counseling material related to the program
		Policy statement regarding job placement process
		Annual follow-up guide and examples of results
6	Advisory Committee	Meeting minutes from at least two meetings per year
		List of advisory committee members
		Budget discussion highlighted in minutes
		Annual follow-up discussion highlighted in minutes
		Review of curriculum highlighted in minutes
		Annual inspection of facilities conducted by committee members

Table 1 (*continued*)

Standard Number	Standard Name	Indicators
7	Instruction	Completed safety exams
		Facilities adhere to safety standards and class rules are being followed
		Documentation of the integration of math, science, communication, and interpersonal skills into the curriculum
		Examples of written exams, hands-on activities, and promotion of ASE testing
		Program evaluation instrument used by administration and reviewed by the advisory committee
		Vehicle work orders and school policies regarding the use of vehicles for instructional activities
		Documentation of active articulation agreements with other educational institutions
8	Equipment	Visual inspection of facilities to ensure all safety protocols are being implemented
		Inventory of all tools, equipment, and consumables
		Preventative maintenance schedule for all equipment
		Tool and equipment replacement schedule highlighted in the advisory board meeting minutes
		Parts purchasing forms

Table 1 (*continued*)

Standard Number	Standard Name	Indicators
9	Facilities	Training stations for bench and on-vehicle repair work
		Evidence of safety signs, fire extinguishers, posted safety procedures, vehicle lanes, and lighting in the instructional areas
		Annual inspection results highlighted in the advisory committee meeting minutes
		Clean and orderly instructional areas
		Office space for faculty members
		Instructional area conveniently located near the classroom
		Separate restrooms and locker facilities for male and female students
		Ventilation system in instructional areas to remove vehicle exhaust fumes
		Written policy for first aid procedures
10	Instructional Staff	Teaching certificate for each instructor
11	Work-based Learning	Training plan for students developed in conjunction with the instructor and employer
		Written work-based learning agreement that is legally binding
		Written policy describing the supervision of the student when at the work-based learning location
12	E-Learning	Written policy describing the availability of technology for students to access e-learning content

Table 1 (*continued*)

Standard Number	Standard Name	Indicators
12	E-Learning (*continued*)	E-learning activities cross referenced to the curriculum not to exceed 25 percent of the hour requirement Learning management system used for e-learning E-learning process highlighted in the advisory committee meeting minutes

Note. Adapted from National Automotive Technicians Education Foundation. (2012). *NATEF Program Accreditation Standards*. Leesburg, VA.

The NATEF standards are one of the few available for trade and industrial programs. They are similar in structure to the 1985 Standards for Technology Education Programs (American Industrial Arts Association, 1985). However, those standards are written specifically for secondary schools.

Recommendations have been made to enhance program standards so they can be more widely used by trade and industrial programs. The National Skills Standards Board (NSSB) developed a system to develop and implement skill standards for training programs (Willis, 1995). By working with industry, the NSSB used their model to develop skill sets for:

- advanced high performance manufacturing,
- agricultural biotechnology,
- air-conditioning, heating, and refrigeration,
- automobile, autobody, medium/heavy truck technician,
- bioscience,

- chemical process industries,
- computer aided drafting and design,
- electrical and construction,
- electronics,
- grocery,
- hazardous material management technology,
- health care,
- heavy highway construction and environmental remediation,
- hospitality and tourism,
- human services,
- industrial laundry,
- metalworking,
- photonics,
- printing,
- retail trade and,
- welding.

In 1995, the National Center for Research in Vocational Education released a report that detailed recommended changes to the Carl D. Perkins Applied Technology and Vocational Education Act of 1990. One of the areas of focus in its recommendations was the improvement of measures and standards (Stecher et al., 1995). Most of these recommendations focused on student outcomes, not program improvement.

More studies need to be conducted related to career and technical education with specific emphasis on assessment (Lambeth, Joerger, & Elliot, 2009). The National

Career and Technical Education Research Agenda Model outlines how research should be conducted in the various career and technical education areas (Lambeth, Joerger, & Elliot, 2009). However, there is little discussion about specific standards to measure program quality.

Meeting standards has become commonplace among educational institutions and evaluations using these standards by industry have become a critical component for career and technical education. Industry wants and needs often drive program improvement. A secondary or postsecondary school's business and industry advisory board can conduct the evaluation; however, industry must take the school's curriculum and policies into account (Zinser, 2003). This is where program standards, agreed upon by educators and industry, protect the interest of both parties.

It should be noted that evaluations by industry do not always follow a standardized format. Performance feedback collected from industry is often conducted as a series of conversations, which do not always follow a structured assessment method (Bartlett, Schleif, & Bowen, 2011). If collaboration of industry and postsecondary educational professionals occurs during the design and evaluation of benchmarks for postsecondary trade and industrial education programs, this effort is more likely to produce the desired outcomes for both the postsecondary program and for employers. Agreed upon program standards can help guide an evaluation and program improvement process.

The National Council for Occupational Education outlines a process for defining a quality technical education program (Everett et al., 2002). In addition to addressing funding requirements for a program, this report recommends a separate analysis for secondary and postsecondary programs. This separation enables evaluations to focus on the specific mission of each type of institution. The National Council for Occupational

Education (1999) identified several standards to assess a secondary and postsecondary program and how to conduct the evaluation. These standards included:

- rates of completion,
- gains in employment status,
- transfer success,
- credentialing success, and
- success in meeting employer expectations.

However, these standards did not incorporate specific differences based on the various career and technical education Career Clusters. The significance of recognizing program standards separately for each Career Cluster is one approach to develop and assess high quality trade and industrial education programs and enables faculty to fine-tune their offerings, so they may deliver workers that meet industry needs.

Perkins funding is available for academic programming and structures, which includes Career Clusters, that can improve connections between secondary and postsecondary institutions (Brustein, 2006). Some states, such as New Jersey, have started to adopt the Career Clusters at the postsecondary level in an effort to better align secondary and postsecondary CTE programs (New Jersey Department of Education, 2012). Madison Area Technical College in Wisconsin uses Career Clusters to show the career pathway from secondary CTE programs to postsecondary degree and certificate programs (Madison Area Technical College, 2013).

Limitations

Factors that limit this study include:

1. This study only investigated standards for trade and industrial programs at the

postsecondary level.

2. Trade and industrial education includes Career Clusters such as construction, human services, and transportation. It is not generalized to other program majors.
3. The panelists selected for the study only represent postsecondary administrators who are responsible for trade and industrial education programs.

Assumptions

The following assumptions were made in this study:

1. Program completion in a postsecondary trade and industrial program will lead to a certificate or an associate's degree and qualify one for employment in a technical career.
2. In the majority of states the trade and industrial majors are identified as part of the 16 Career Clusters established by the Office of Career Technical and Adult Education (OCTAE), formerly the Office of Vocational and Adult Education (OVAE), and the United States Department of Education in 1999, not by individual states. These include agriculture, architecture, arts, business, education, finance, government, health science, hospitality, human services, information technology, manufacturing, marketing, public safety, STEM, and transportation.
3. Program standards can be determined by experts working in these program areas and these can be used to evaluate high quality postsecondary trade and industrial education programs.

Procedures

The Delphi technique was utilized for this study. The purpose of a Delphi study is to gain a reliable consensus of opinions from a panel of experts (Dalkey & Helmer,

1963). The panel of experts was used to determine which program standards should guide the development and assessment of high quality trade and industrial education programs.

Postsecondary trade and industrial education program administrators would become the expert panel for this study. In cooperation with the Association of Career and Technical Education (ACTE), nominees were solicited to participate. By using a national organization, the researcher was able to invite panelists from all parts of the United States. To ensure all eight trade and industrial education areas were represented, the researcher compiled a list of postsecondary trade and industrial education administrators for institutions with multiple programs. After the nominations were received, invitations to participate were e-mailed to the potential panelists until 16 members were secured for the study. The researcher sought to identify a panel that would represent all trade and industrial education Career Clusters.

Prior to the start of the research project, a pilot study was conducted with postsecondary administrators in the researcher's home state. The pilot was used to determine if the instrument would yield the desired responses prior to its use by Delphi panelists. The pilot participants were invited to provide feedback regarding the quality of the survey.

In Round 1, the panelists were instructed to complete an online survey that asked them to provide two standards they felt important to establish a high-quality trade and industrial education program. The panelists were also asked to provide a description for each standard they suggest. A three-member external review board made up of postsecondary administrators not associated with the study then grouped the results into similar standards and drafted a common description statement for each standard.

In Round 2 the participants were asked to review the standards and definitions from the first round and to provide additional standards they felt were missing. These standards were used to develop the third and fourth round surveys.

In Round 3 the participants were asked to rate the importance of the standards from Round 2 using a 5-point Likert scale survey. For Round 4, the panelists received the same survey as Round 3 with the addition of the statistical information generated from the prior round's survey. The panelists were asked to again rate the standards using a five-point Likert scale having the knowledge of the statistical results from the previous round. The survey rounds were designed to generate consensus among the panelists.

Definitions of Terms

The following terms are defined in order to clarify their meanings to the reader:

- Career Clusters – "occupational categories with industry-validated knowledge and skills statements that define what students need to know and be able to do in order to realize success in a chosen field" (United States Department of Education, 2008, p. 1).
- Career and Technical Education –

> The term 'career and technical education' means (a) organized educational activities that offer a sequence of courses that provides individuals with coherent and rigorous content aligned with challenging academic standards and relevant technical knowledge and skills needed to prepare for further education and careers in current or emerging professions and (b) competency-based applied learning that contributes to the academic knowledge, higher-order reasoning and problem-solving skills, work attitudes, general employability skills, technical skills, and occupation-

specific skills, and knowledge of all aspects of an industry, including entrepreneurship, of an individual. (Carl D. Perkins Career and Technical Education Act of 2006, p. 120, Stat. 686)

- Description of a Standard – "provides the foundation from which the standards are interpreted" (National Center for Public Policy and Higher Education, 2009, p. 45).
- High-Quality Program – a program that can improve a learning outcome, utilize objective data, develop measurable goals and objectives, and implement scientifically based activities that meet identified needs (No Child Left Behind Act of 2001).
- Postsecondary Education – Formal higher education that occurs after the 12th grade.
- Standard – "descriptive statements established by key professionals and used as a model to assess the degree to which a program meets qualitative and quantitative characteristics of excellence" (American Industrial Arts Association, 1985, p. 8).
- Trade and Industrial Education – a cluster of career and technical education programs defined by the United States Department of Education (2008) that includes the following areas:

  Architecture and Construction

  Arts, A/V Technology, and Communications

  Government and Public Administration

  Human Services

  Information Technology

Law, Public Safety, and Security

Manufacturing

Transportation, Distribution, and Logistics

Summary and Overview

Industry's need for skilled labor has made trade and industrial education an important part of postsecondary educational institutions' missions. Students are looking for educational programs that will enable them to obtain job skills or to be retrained for secure and improved employment. To ensure that industry receives the quality workers they require, viable programs must be created. To assist them, standards need to be defined and evaluated. This study is designed to provide a statement of consensus regarding program standards and how these can be used to evaluate postsecondary trade and industrial programs. This study is significant for its potential in assisting others to develop high quality programs.

This study is only focused on trade and industrial programs at the postsecondary level. It did not account for career and technical education as a whole. It also did not factor in the opinions of secondary education administrators. The definition of program standard is narrow to include measures that are recognized by teachers and administrators of trade and industrial programs so they can be applied most effectively to those programs. Additionally, the panel of experts for the study is limited to identified experts who assist in designing programs at the postsecondary level.

This study assumes that postsecondary institutions offer a certificate or degree program in major trade and industrial study areas. Another assumption is that trade and industrial programs are part of the 16 Career Clusters as defined by the U.S. Department of Education. Finally, it is assumed that program standards can be developed and used as

a program design and evaluation tool.

Chapter II provides a review of literature for establishing a knowledge base for this study. Previous writings provided historical references for developing program standards. The review also supports significance for this study.

Chapters III and IV discuss the mechanics of the study. The data collection procedures and instruments are described, as well as how data were analyzed. The findings from the data analysis of this Delphi study are reported.

Chapter V will provide the researcher's conclusions drawn from this analysis along with suggestions for implementation of the standards to postsecondary trade and industrial education program administrators. These suggestions, along with recommendations for future research, will provide guidelines for developing model programs in trade and industrial education.

CHAPTER II

REVIEW OF LITERATURE

This chapter will review literature related to factors that might be used for designing and assessing high quality postsecondary trade and industrial education programs. The history of trade and industrial education will be discussed, including postsecondary education's role in workforce and technical training. In order to understand the role standards play in education, the various uses of standards by educational agencies and industry will be reviewed. Different assessment methods by educators and industry to judge standard attainment will be discussed to show how they are used to ensure the standards are being followed. Additionally, current initiatives to recognize exemplary training programs will be reviewed. Finally, the foundation and application of the Delphi method used for educational research will be explained.

History of Trade and Industrial Education

The roots of trade and industrial education in the United States can be traced back to the colonial period. In the 1700s, as the United States became a nation, a trained workforce to support its economy was required. The concept of apprenticeships was brought to the colonies from Europe in the 1600s. The apprenticeship system provided children from low-income families not only skills training, but basic educational instruction (Barlow, 1976). Children could use the lessons learned through the apprenticeships to acquire a trade and improve their social standing through education (Barlow, 1976). The apprenticeships were mainly confined to developed areas of the United States. In rural areas, most children worked on the family's farm. The education they received was passed on from previous generations (Hogg, 1999).

After the U.S. Civil War in 1865, apprenticeship programs began to decline

(Hogg, 1999). Skilled tradesmen from Europe, enticed by freedom, mobility, an abundance of land, and the promise of financial opportunities, immigrated to the United States, bringing with them a wealth of technical knowledge (Barlow, 1976). In manufacturing, as the machinery of the Industrial Revolution began to automate the tasks that were previously conducted by individuals, the role of apprentices diminished (Hogg, 1999).

The Industrial Revolution created a need for a different type of skilled labor in urban centers. Workers were required to run the new machinery and to keep the equipment operating properly. Mechanic institutes, originally developed in England, were established in the major cities of the United States to address the growing need for skilled technicians to service and maintain equipment (Barlow, 1976). From 1826 through 1876, independent schools were developed to support the Industrial Revolution (Hogg, 1999). In 1831, the Manual Labor Movement was started by the Society for Promoting Manual Labor in Literacy Institutions in an effort to bring technical education into the public schools (Hogg, 1999). In 1895, as the United States observed the rise of Germany's economy through a close connection between their industries and schools, the National Association of Manufacturers was formed to explore ways in which schools could support the American manufacturing systems (Kantor, 1986).

The U.S. government's support for postsecondary institutions to provide vocational training can be traced to the Morrill Act of 1862. This legislation gave individual states land to sell to raise money for establishing a college that benefited agriculture and mechanical arts (Hogg, 1999). Early training programs included agriculture, science, and engineering.

Various types of postsecondary schools emerged from the late nineteenth century

to the early twentieth century. Trade schools, such as the Hampton Normal and Agricultural Institute and the New York Trade School, began to provide students with the labor skills necessary to be successful in mechanical trades (Hogg, 1999). Companies wanting to develop a workforce suited to their needs established corporation schools, some of which are still active today. General Electric, Westinghouse, and International Harvester all started their own corporation schools which addressed employee deficiencies that could hamper increased productivity (Hogg, 1999). In 1913, 37 companies founded the National Association of Corporation Schools (NACS) as a way to share ideas and information regarding factory-based education (Kantor, 1986).

It was during this time that David Snedden's ideas were beginning to shape the future of vocational education. Snedden, the 1910 Commissioner of Education for Massachusetts, believed liberal education and vocational education had separate goals and outcomes. He classified vocational education into five occupational areas: professional education, commercial education, industrial education, agricultural education, and education in the household arts (Wonacott, 2003). He believed there were three stages for vocational education, and these addressed elementary students under 15 years old, secondary students ages 15-19, and higher vocational training for those over 18 (Snedden, 1910).

Charles Prosser, considered the father of vocational education, agreed with Snedden's ideas (Barlow, 1976). Prosser (1912) stated that schools would become democratic "when we learn to train all kinds of men, in all kinds of ways, for all kinds of things" (p. 406). Table 2 lists the 16 theories of vocational education that became the foundations for this training (Wonacott, 2003).

Table 2

Prosser's Sixteen Theories of Vocational Education

Theory Number	Theory
1	Vocational education should occur in the most realistic setting that replicates the work environment.
2	Vocational education should only be given where the training jobs are carried on in the same way, with the same tools, and with the same machines as in the occupation itself.
3	Vocational education should provide students with thinking habits – technical knowledge and scientific problem-solving skills – and the manipulative skills required in the occupation itself.
4	Vocational education should be planned and delivered in a manner that capitalizes on the student's interest, aptitudes, and intrinsic intelligence to the highest degree.
5	Vocational education is not for everyone, but for those individuals who need it, want it, and are able to profit from it.
6	Vocational education should provide opportunities for students to repeat operations of thinking and manipulative skills until habits are formed characteristic of those required for gainful employment.
7	Vocational education should be taught by instructors who have successful experience in the application of skills and knowledge required of competent workers.
8	For every occupation there is a minimum of productive ability which an individual must possess in order to secure or retain employment in that occupation.
9	Vocational education should prepare individuals for the occupations as they currently exist in the workforce and for future labor markets as a secondary concern.
10	Vocational education should provide opportunities for students to perform operations on actual jobs and not only simulated work tasks.

Table 2 (*continued*)

Theory Number	Theory
11	The only reliable source of content for specific training in an occupation is in the experiences of masters of that occupation.
12	For every occupation there is a body of content which is peculiar to that occupation and to which has practically no functional value in any other occupation.
13	Vocational education should meet the needs of individuals when it is needed and in such a way that they can benefit from it.
14	Vocational education is more effective when its methods of instruction are best suited to the best characteristics of any particular group it serves.
15	The administration of vocational education will be efficient in proportion as it is elastic and fluid, rather than rigid and standardized.
16	While every reasonable effort should be made to reduce per capita cost, there is a minimum below which effective vocational education cannot be given, and if the course does not permit this minimum per capita cost, vocational education should not be attempted.

Note: Adapted from H. R. Gordon. (2014). *The history and growth of career and technical education in America.* Long Grove, IL: Waveland Press. pp. 41-42.

These early foundations further differentiated general education from vocational education. Prosser wanted schools to train students to develop useful job skills, and he felt all students could benefit from vocational training, even if they were not going into a trade.

Prosser's beliefs were in direct contrast to John Dewey's ideas, which had a broader definition of occupational training. Dewey (1916) believed that education should encourage growth and the lifelong ability to continue learning. He also believed that education was a mechanism to improve the individual, giving the student control over his

or her own fate. His focus was on the individual before the needs of industry.

The Smith-Hughes Act of 1917, also known as the Vocational Education Act, established the foundation for vocational education development on a state and national level, requiring each state to submit a vocational education plan to be approved by the federal government (Roberts, 1957). Federal funds were allocated to support vocational teacher training and salaries. States were required to match the federal funding dollar-for-dollar in support of vocational education in the public schools (Hogg, 1999). The Act also created the first federal Commissioner for Vocational Education, a position filled by Charles Prosser in 1917 (Wonacott, 2003).

Through the 1920s and 1930s, vocational education continued to progress. Additional federal funding acts, such as the George-Ellzey Act of 1929, which provided funding for education in agriculture and home economics, and the George-Deen Act of 1936, which provided additional funding for education in agriculture, home economics, trade and industries, and teacher training, helped to keep vocational education initiatives moving forward (Hogg, 1999).

The U.S. military provided further access to vocational education. From 1940 to 1946 the National Defense Training Program provided funds to support manufacturing training of nearly 7.5 million people to perform jobs and tasks related to the war effort, with 20 percent of them being women (Hogg, 1999). After World War II, the federal government passed the George-Barden Vocational Education Act of 1946. This Act provided $36 million for vocational education to support the nation's post-war reconversion efforts (Hogg, 1999). It allowed state educational agencies to provide funding for state director salaries and expenses, salaries and travel expenses for vocational counselors, training programs for out of school youth, and equipment and

supplies for vocational instruction (Barlow, 1976). The nation's national defense initiative often spurred the development of career and technical education programs. In 1958, the National Defense Education Act was passed as a response to a perceived weakness (brought about by the Soviets launching the first orbiting satellite, Sputnik) in the population's readiness for skilled labor (Walter & Farmer, 1999). A greater emphasis was placed on science, mathematics, and technical education, which was a predecessor to today's STEM education.

Through the 1960s, vocational education was called upon to train all sectors of the population as the nation's social awareness began to take shape. In October 1961, President John F. Kennedy announced the appointment of the Panel of Consultants on Vocational Education, which would review and evaluate the National Vocational Education Acts and provide recommendations for improvements (Barlow, 1976). From the panel's investigations, it was concluded that vocational education must offer training opportunities for non-college graduates entering the workforce, provide training for the workers whose job skills need updating, meet the need for skilled craftsmen during and after the high school years, expand technical training to meet labor market and national economic needs, and make educational opportunities available to all citizens (Barlow, 1976). In 1963, the comprehensive Vocational Act of 1963 was passed to address the wide range of vocational issues that were brought to light by this panel and served as a rewrite of prior CTE legislation, with the exception of the Smith-Hughes Act (Barlow, 1976). The Act expanded the role of vocational education and allowed greater flexibility in the funding rules to include individuals from all areas of the population (Hogg, 1999). Citizens in urban and rural areas would be able to have equal access to vocational training, as funding for vocational training facilities would be made available (Barlow,

1976).

Additional articles of legislation supporting career and technical education were passed during the 1970s and 1980s. In 1971 the U.S. Congress passed an amendment to the Vocational Act (Section 406, Public Law 93-380) which stated that every student should be prepared for gainful employment by the time he or she complete secondary school, that every school district must provide employment preparation for all of their students, and that the state and local education agency must provide the widest variety of career education for students (Barlow, 1976). In 1977, Congressman Carl D. Perkins introduced The Elementary and Secondary Career Education Act of 1977 that was signed into law by President Gerald Ford, which intended to provide funding for the implementation of career education throughout the nation (Drier, 1977).

In 1983, The National Commission on Excellence in Education released *A Nation at Risk* to the U.S. Department of Education. This report identified low standards and poor performance in the U.S. education system as the cause of the decline of the United States' economic competiveness in the international community (Gordon, 2014). The report is one of the motivating factors behind the United States' educational reform and the legislation that followed.

The Carl D. Perkins Vocational Education Act of 1984 had provisions for retraining the workforce to acquire the necessary skills for emerging, high technology fields (Hogg, 1999). Postsecondary institutions would benefit from this Act, as well as the subsequent 1990 Perkins Act, as they would receive federal support based on their ability to provide occupational-specific skills (Walter & Farmer, 1999). This funding helped the community college systems provide students with the advanced level skills needed to obtain employment that they could not have attained through secondary

education. The U.S. federal government in 1998 and 2006 renewed the Perkins Act. The 2006 Carl D. Perkins Career and Technical Education Act (Perkins IV) placed greater emphasis on postsecondary indicators such as "technical assessments that align with industry standards, student attainment of an industry-recognized credential, and student transfer to a baccalaureate degree program" (Carl D. Perkins Career and Technical Education Act of 2006, p. 120, Stat. 697). These types of legislation helped career and technical education adapt to the changing realities of the workforce's needs.

In 1991, the first report from the Secretary's Commission on Achieving Necessary Skills (SCANS) was published. This report outlined what students needed to know to be successful in the future economy (Hogg, 1999). As shown in Tables 3 and 4, the Commission defined the workplace know-how using two elements: competencies and foundation skills (United States Department of Labor, 1991).

The Workforce Investment Act of 1998 provided mechanisms to meet the training needs of employers while helping to provide training opportunities for job seekers (Clagett, 2006). This federally funded program addressed workforce development as a system and reduced government overlap.

Table 3

SCANS Competencies (1991)

Competency	Number	Title
Resources	C1	Allocates Time
	C2	Allocates Money
	C3	Allocates Material and Facility Resources
	C4	Allocates Human Resources
Information	C5	Acquires and Evaluates Information
	C6	Organizes and Maintains Information

Table 3 (*continued*)

Competency	Number	Title
Information (*continued*)	C7	Interprets and Communicates Information
	C8	Uses Computer to Process Information
Interpersonal	C9	Participates as a Member of a Team
	C10	Teaches Others
	C11	Serves Clients/Customers
	C12	Exercises Leadership
	C13	Negotiates to Arrive at a Decision
	C14	Works with Cultural Diversity
Systems	C15	Understands Systems
	C16	Monitors and Corrects Performance
	C17	Improves and Designs Systems
Technology	C18	Selects Technology
	C19	Applies Technology to Task
	C20	Maintains and Troubleshoots Technology

Note: Adapted from United States Department of Labor. (1991). *What work requires of schools: A SCANS report for America 2000.* Washington, DC.

Table 4

SCANS Foundation Skills (1991)

Foundation Skill	Number	Title
Basic Skills	F1	Reading
	F2	Writing
	F3	Arithmetic
	F4	Mathematics
	F5	Listening
	F6	Speaking
Thinking Skills	F7	Creative Thinking
	F8	Decision Making
	F9	Problem Solving
	F10	Seeing Things in the Mind's Eye
	F11	Knowing How To Learn
	F12	Reasoning

Table 4 (*continued*)

Foundation Skill	Number	Title
Personal Qualities	F13	Responsibility
	F14	Self-Esteem
	F15	Social
	F16	Self-Management
	F17	Integrity/Honesty

Note: Adapted from United States Department of Labor. (1991). *What work requires of schools: A SCANS report for America 2000.* Washington, DC.

This Act provided guidelines for one-stop delivery of training services, youth activities, Job Corps, and training activities for adult and dislocated workers. This legislation better aligned with business needs while offering a wider range of services (Clagett, 2006).

In 1991, the U.S. Department of Education and OVAE were the key educational organizations that developed Career Clusters, which defined what students are required to know in order to become successful in a chosen field (United States Department of Education, 2008). Table 5 outlines the eight Career Clusters within the trade and industrial division of CTE. These clusters are part of the 16 total Career Clusters.

Table 5

Trade and Industrial Education Career Clusters

Career Cluster	Description
Architecture & Construction	Prepares students to design, plan, manage, build, and maintain structures such as houses, buildings, bridges, or machinery.
Arts, A/V Technology, Communications	Prepares students to apply skills in performing and visual arts, audio/video technology, broadcasting, printing, or telecommunications in a variety of venues and facilities.

Table 5 (*continued*)

Career Cluster	Description
Human Services	Prepares students for careers that help families and individuals with life services such as counseling, early childhood development, family services, and personal care services.
Information Technology	Prepares students to design, develop, and manage different types of computer hardware, software, and networking components and systems.
Law, Public Safety, Corrections, & Security	Prepares students for responsibilities that include prevention and protection from crime and natural disasters.
Manufacturing	Prepares students to plan, manage, and process materials into intermediate or final products. Includes professional and technical support activities such as production, planning, and manufacturing/process engineering.
Science, Technology, Engineering, & Mathematics	Prepare students for careers that utilize science, technology, engineering, and mathematics. Jobs within this field require in-depth research to provide solutions to a variety of technical problems within numerous fields.
Transportation, Distribution, & Logistics	Prepares students to plan, manage, or repair company products through a range of transportation services. Logistics include all forms of transportation including road, rail, air, and water.

Note: Adapted from Virginia Department of Education. (2012). *Career Clusters.*

In the 21st century, vocational education began to evolve once again. In 2006, Perkins IV was released with an important educational change. Vocational education was renamed as career and technical education (CTE), a title that is still used today. This change in wording was designed to change the image of vocational training and its purported negative stereotype, which was often associated with less educated, lower status individuals (Anamuah-Mensah, 2004). Science, Technology, Engineering, and Mathematics (STEM) education has put more focus on technical careers that emphasize

science, technology, engineering, and mathematics. Fares and Puerto (2009) state that training is a response from government to counteract unemployment and employment barriers.

Postsecondary Trade and Industrial Education

Federal legislation has changed along with postsecondary institutions to provide workforce education for the adult learner. Postsecondary institutions have played a role in workforce training. Community colleges, proprietary schools, corporate schools, and four-year institutions have provided career and technical education to their students. Postsecondary vocational preparation provides the occupationally specific education that is part of an education continuum that starts at the beginning of the secondary level (Bragg, 2001). The differences lie in the mission of each type of school. Historically, four-year institutions offer a wide range of subjects for students to choose from, some of which do not provide them with job-specific skills. Other schools include career training as a primary goal. They typically provide training for specific industries and communities. However, postsecondary occupational education has often been considered second-class education when compared to academic or transfer programs (Grubb, 1999).

As postsecondary institutions closely align themselves with industry, they are able to better prepare their students for their role in the workforce. Considering that the Bureau of Labor Statistics projected that 70 percent of job openings between 2001 and 2010 did not require a four-year degree, postsecondary institutions must determine which student outcomes best prepare them for a skilled trade (Cohen & Besharov, 2002). Community colleges have several "communities" to serve. Traditionally the community college serves the local community. Today the community can refer to a geographical area, a specific student population, or even an industry. The community college still

must make decisions that benefit all communities and not just a lucrative partnership with industry (Vacik, Nadler, & Miller, 2006).

Some schools offer trade education through non-credit courses. Community colleges engage in contract training in order to meet the specific needs of industry and to deliver this instruction in a short timeframe (Dougherty & Bakia, 2000). Workforce development programs can help business and industry as well as their related economic sectors. Alssid et al. (2002) recommended that workforce development programs should prepare workers for positions within key economic sectors.

The long held belief that students graduating high school should pursue a baccalaureate degree in order to become successful may not fit the needs of today's job market. To address this issue, Perkins IV provides funding for secondary schools to link their relative elements of their CTE offerings to the postsecondary level (Brustein, 2006). Studies have been conducted showing that students receiving a postsecondary degree in career and technical education are more likely to have higher earnings than those students who do not receive a degree (Laanan, Compton, & Friedel, 2006). However, Bishop and Mane (2004) argue that while the earning potential would be higher for an associates degree completer, the benefit-cost ratio and internal rates of return for a high school career and technical education program will be higher than a college program.

Many students attend institutions that emphasize vocational education in hopes that their training will lead to a better job and higher wages (Schmidtke, 2012). Often students who enroll in trade training programs are considered mid-skilled workers (Torraco, 2008). They primarily receive their training from technical colleges, community colleges, proprietary schools, and privately funded job training programs. Students in these programs benefit from labs and work-based learning that can be directly

applied to their job. Other students enroll in postsecondary school simply to upgrade their job skills and are not interested in achieving a credential (Hirschy, Bremer, & Castellano, 2011). Noncredit vocational training at the postsecondary level is an important contributor to nontraditional pathways through higher education (Bailey & Kienzl, 1999).

Successful postsecondary institutions have strong partnerships with industry, government, and education (Wismer, 1994). Programs that work in cooperation with these entities can develop trade programs that provide competencies for students that can be applied to the business community. Community colleges, when providing professional development for businesses, can provide credentials that go beyond occupational training (Schmidtke, 2012). Interaction with local employers, along with a curriculum driven by the labor market, helps to establish a successful program (Hereford, 2005). The college must have an internal understanding of a business culture when engaging in partnerships with business and industry (United States Department of Education, 2012a).

Standards

Standards can be defined as "descriptive statements established by key professionals and used as a model to assess the degree to which a program meets qualitative and quantitative characteristics of excellence" (American Industrial Arts Association, 1985, p. 8). A major component of a quality CTE program is its ability to meet accrediting standards set by industry, accrediting boards, and current Perkins legislation. These standards provide the framework in which the technical program will operate. They also guide the program to ensure the outcome is a skilled worker in the trade. The Perkins Act of 1990 required states to implement performance measures and

standards to use for vocational education program evaluation and improvement (Belcher, McCaslin, & Headley, 1996). The Perkins Act of 2006 defines the requirements that a CTE program must follow in order to receive federal funding (Brustein, 2006). However, there is not a commonly accepted definition of standards that were developed by business, state educators, and the federal government (Losh, 2000). Additionally, standards in postsecondary CTE focus on occupational skill standards in an effort to satisfy Perkins requirements (Merkley & Johnston, 2007).

In 1993, the federal government passed the Goals 2000: Educate America Act, which established a National Skills Standards Board to promote standardized occupational skills for each vocational area (Bailey & Merrit, 1995). A skill standard, as defined by the National Skills Standards Board (2000), answers the questions "what does someone need to do on the job to perform competently?" (p. 2) and "what knowledge and skills will enable them to carry out these responsibilities?" (p. 2). In 1992, the U.S. Department of Education and Department of Labor funded a project to develop voluntary skills standards for various industries (Lee, DeWitt, & Litman, 1996). These standards were to be used to communicate the expectations for the occupational skills to employers, educators, and workers.

The development of skill standards emerges from education and industry (Willis, 1995). Vocational education, along with business and industry experts, determine the common tasks found in most businesses. The list is compiled and used to develop curriculum, instructional activities, and evaluation criteria (Willis, 1995). Industry approaches skill standards differently. Many industry driven skill standards are based on the issuance of a skill-based credential (Willis, 1995). Many industry representatives want a clearer understanding of what the standards, certification, and training represent

because "they fear that national skill standards mean government intervention in their business and industry" (Anderson & Kosarek, 1997, p. 22). The 2004 National Assessment of Vocational Education (NAVE) found that employers collaborated with postsecondary institutions to develop curriculum for their local needs rather than follow national standards (Silverberg, Warner, Fong, & Goodwin, 2004).

Other countries have similar initiatives based on industry and government partnerships. Australia has adopted a "Training Package" for its Vocational Education Training (VET). In this model, industry, not the government, developed the competency standards for career and technical education programs (Rahimi, 2009). By giving industry a larger role in education, students are better prepared to enter the world of work. The standards are based on the market need, which makes the VET system a direct partner with industry. Another benefit to the Training Package initiative is that curriculum was being developed by the teachers in conjunction with industry. This allows greater flexibility to custom-build curriculum to meet industry demands, as well as allowing needed changes to happen at a quicker pace.

In Kenya, the Technical and Vocational Education and Training (TVET) programs provide trade skills to students throughout the country based on industry skill standards. The government is working toward becoming self-reliant when it comes to industrial skills and knowledge (Mupinga, Busby, & Ngatiah, 2006). In addition, the country is trying to decrease its high unemployment rate. The TVET programs are being looked upon as a means to provide jobs and stimulate the economy. The programs that are offered at a variety of postsecondary schools provide technical education and apprenticeships. Despite the ongoing challenges of obtaining sufficient funding and need for higher level degree programs, the TVET programs are looked at by government as an

important part of the country's revitalization.

In Turkey, industry and education have worked together to develop skill specific training for the workforce. The Group Leader Training Program (GLTP) was implemented by Bosch Bursa Diesel Systems and The Uludag University Vocational School of Technical Sciences to develop technical and leadership skills for the Bosch employees using Bosch's standards (Arslan, Kuş, Mumcu, & Uzaslan, 2008). The training conducted by the school yielded the return on investment that the company was seeking. By going through this training, the workers received a well-rounded education that led to improved problem solving and having a dynamic approach to constant improvement. These were some of the traits that the company was looking for when they embarked on this partnership.

Employer engagement in postsecondary education may help to integrate industry-driven competencies along with setting standards for apprenticeship programs (United States Department of Education, 2012b). One example of this industry involvement exists with the Automotive Manufacturing Technical Education Collaborative (AMTEC). In an effort to address their industry needs, AMTEC has set goals for their partnering postsecondary institutions to integrate industry skill standards into the curriculum and identify assessments that align with industry certification (United States Department of Education, 2012b).

Standards can be implemented for a program as well as a skill. NATEF provides a set of skill-based standards, as well as program-based standards, for secondary and postsecondary automotive technology education programs to follow. In order to become accredited by NATEF, the program must comply with the standards in 10 major areas (National Automotive Technicians Education Foundation, 2012). These standards cover

all aspects of the program, including administration, finances, facilities, curriculum, and advisory committees.

Some states have adopted their own guidelines which include standards for programs to follow. Texas issued guidelines for their higher education workforce education courses that cover both credit and non-credit courses (Texas Higher Education Coordinating Board, 2010). The guide that was published addressed several standards, including faculty, graduate credentialing, facilities, course development, and advisory committees. Many of the standards provide a general statement regarding the expectations (such as facilities), while other standards provide an in-depth explanation regarding the requirements for achieving the standards (such as characteristics of an awarded degree).

Illinois has adopted technology literacy standards for its technology programs (Illinois Office of Educational Services, n.d.). These standards focus primarily on student outcomes for the industry's expectations for computer competency and will be implemented in the state secondary schools. The standards for technological literacy were developed by the International Technology Education Association (ITEA) in an effort to increase the opportunity for students to attain technological literacy through their education (Technology for All Americans & International Technology Education Association, 2003). These competencies are not skill specific but align with Illinois Occupational Skill Standards (Illinois Office of Educational Services, n.d.).

Other areas of workforce training utilize standards for their programs. The Virginia Department of Labor and Industry (2000) developed a guideline for their apprenticeship programs called Minimum Standards for Apprenticeships. This guideline specifies the requirements for an employer to engage in an apprenticeship program.

Standards for this program include the terms of the apprenticeship, supervision, on-the-job training, responsibilities, evaluation, and wages.

The study of the development of quality standards for trade and industrial educators is an important part of ensuring quality, professionalism, and teacher retention for trade programs (Walker, Gregson, & Frantz, 1996). Trade and industrial programs often struggle to retain qualified instructors who can build momentum for their programs (Crawford-Self, 2001). Walker, Gregson, and Frantz (1996) conducted a study that focused on trade and industrial teacher preparation programs, noting that a quality preparation program will lead to quality instructors.

Walker et al. (1996) recognized the importance of standards for programs that train trade and industrial education teachers. The National Association of Industrial and Technical Teacher Education (NAITTE) proposed a set of standards that represented a core of accomplished teacher training practices. These standards provided guidelines that could be adopted for various types of educational institutions and resource availability.

Assessment Methods

While standards describe the knowledge, skills, and behaviors critical to an occupational area, assessments determine the level at which those standards are achieved. Assessments can be conducted on a national scale, at the program level, on a specific aspect of a program, or on students' achievements. Assessment of vocational education can be classified into two themes: assessment of learning and performance and assessment of education process and design (Brown, 1997). Identifying what to assess is critical to determine the overall outcome of the training program.

Assessment by industry is one method a trade and industrial program can determine if it is meeting the defined standards. Surveying local employers can reveal

both the strengths and weaknesses of the program. A school's business partners can be brought in to evaluate the program based on industry's needs and goals (Zinser, 2003). When the workplace becomes the curriculum (as in work-based learning), the relationship of assessment will shift from education to employers (Abeysekera, 2006). However, this may be a desired outcome if the program includes processes and knowledge based in the workplace.

The federal government has supported efforts to document the assessment of vocational education. The 2004 National Assessment of Vocational Education (NAVE) report assessed vocational education based on improvement of secondary school student outcomes, the impact of vocational education and its relationship to workforce development efforts, and the impact of flexibility and accountability on program quality and student outcomes (Silverberg et al., 2004). The results of this report were designed to give Congress information to guide the reauthorization of the Perkins IV Act.

Workforce development programs may have varying program outcomes for secondary and sub-baccalaureate postsecondary training. Mullin (2012) stated that the assessment model for workforce development training has metrics that can be applied to the evaluation of educational programs. The metrics are earnings, placement, licensure, industry certification, and debt measures.

The Perkins IV Act requires that postsecondary schools assess their programs based on technical skills attainment, graduation rate, retention and transfer rate, employment placement rate, nontraditional participation rate, and nontraditional completion rate, which are defined by the Perkins Performance Accounting Reporting System (Kotamraju, 2012). If the school meets its assessment targets, it will not have to engage in corrective action. However, every state defines their outcome measures

differently. The Perkins Act requires that states establish a system to report on the level of student achievement of technical skills, thus requiring the CTE programs to utilize technical skill assessments (Brustein, 2006; Munyofu & Kohr, 2009).

Assessment of a community college program that offers a certificate in a specific area has traditionally been conducted by collecting data on the number of students who receive the certificate. However, many students in the community college often leave college without the certificate once they have achieved the job skills they desire and obtain better employment (Lohman & Dingerson, 2005). Lohman and Dingerson (2005) recommended an alternative method to assess these programs by the number of students that have met their personal training goal. Several states (e.g., Indiana, Oklahoma, Kentucky, Wisconsin) have recognized this challenge and passed legislation to improve postsecondary attendance and completion (Hirschy, Bremer, & Castellano, 2011).

An emerging trend that ensures a program meets current standards is to align it with the desired workplace outcomes (Rojewski, 2007). In order to accomplish this, the school can perform a needs assessment of local businesses. The needs assessment can foster a sense of collaboration between the school and the business, which in turn will better align the school with that business' standards (Bartlett, Schleif, & Bowen, 2011).

Another method to align a program to workplace outcomes is through occupational certificates. Many occupational certificates and licenses require that students go through an assessment process which may include board and licensing exams (McCaslin & Headley, 1993). However, assessment of the program may be more difficult if they do not have an external accreditation requirement (Torraco, 2008).

Another source of program assessment can be found with a program's advisory committee. The committee, working in conjunction with a school, is made up of local

businesses that represent the industry with which the program aligns. Through a program review, they can evaluate the program's curriculum, assess graduate quality, and make recommendations for future course offerings that will directly impact the program's ability to align with industry standards (Kerka, 2002).

Assessment benchmarks have been used to determine the effectiveness of alternative teacher certification programs. A five-year study on the Accelerate Online/OPTIONS alternate credentialing program for high school teachers in Texas used five specific assessment benchmark ratios to determine effectiveness (Denton et al., 2008). The assessment benchmarks are applications/inquiries, candidates/applicants, field placements/candidates, teachers certified/candidates, and teachers retained/teachers certified. These benchmarks provided the quantitative data to annually assess the progress of the program.

State agencies and individual schools often engage in forms of program assessment. The Peoria Unified School District worked with over 130 stakeholders, which included teachers and members of local businesses, to develop an assessment system for their secondary CTE programs (Beltram, 2011). This system had three main areas of assessment, which included student learning, community connectedness, and capacity development. The assessment in student learning included academic integration, transition into and out of high school, delivery of the CTE model, and curriculum development and assessment (Beltram, 2011). The assessment in the community connectedness area required a school to market their CTE programs to all their stakeholders and to recruit and retain their community partners (Beltram, 2011). Finally, capacity development used recruitment and retention of quality CTE teachers and the quality of CTE teachers' skills as assessment benchmarks. Each school's CTE programs

are assessed based on this new system, and the schools use the information to make improvements.

Some schools have adopted the Postsecondary Education Research Center's (PERC) evaluation tool to determine the effectiveness of their dual enrollment transition programs. This evaluation tool has ten areas of assessment which include program planning, staffing, administration, student planning, student activities, employment, self-determination, interagency collaboration, monitoring, and evaluation (Grigal, Dwyre, Emmett, & Emmett, 2012). Currently, the Connecticut State Department of Education uses this tool to assist eight dual enrollment programs carry out yearlong evaluations.

The St. Louis County Special School District developed Program Status Indicators (PSI) to assess their CTE programs. The five assessment factors they used were placement, enrollment, advisory committees, certification, and occupational outlook (Gaal & Trafton, 2009). After performing the assessment, the school district was able to determine which programs were performing to standards and which programs were in danger of being terminated.

On a larger scale, assessments by a government agency or accrediting body of postsecondary education introduce a larger amount of assessment factors for a school to provide data. The Postsecondary Education Quality Assessment Board of Ontario (PEQAB, 2008) provides a self-evaluation guide for its schools in preparation for a formal assessment and is part of the renewal process. The self-evaluation has 15 different assessment factors (benchmarks) that schools must be scored on before the evaluation committee reviews the application for renewal. The assessment factors cover/span a wide variety of topics that include, but are not limited to, employment rates, program outcomes, accreditations, assessment of students, and program reviews.

Postsecondary institutions align with various regional accrediting agencies. One agency, the Council on Occupational Education (COE), provides accreditation for a variety of types of postsecondary schools to include military and government training programs. The COE awards accreditation to institutions that offer CTE programs as well as programmatic accreditation and is recognized by the U.S. Department of Education (Council on Occupational Education, 2012). They assess programs for accreditation based on five main factors that include admissions and student services, programs, instruction, program outcomes, and distance education.

Return on investment (ROI) is one factor that can be used for training assessment, but it lacks a standardized definition for CTE (Fretwell, 2007). Kotamraju and Mettille (2012) argue that a standardized ROI model can be used as an assessment factor for reporting internal efficiency and external effectiveness of the application of the Perkins Act for CTE programs. Additionally, conducting ROI on CTE programs can help meet accountability requirements, program improvement, and marketing efforts. While the overall evidence exists that ROI for education and training is high, this factor should be used as a broad measure and not as a precision tool (Fretwell, 2007).

Other countries have also made efforts to assess their training programs. Coates (2009) proposed an evaluation system for Australia's VET programs. The author focused on quality indicators that provide direct measures of education and training outcomes. Coates proposed that the indicators include learner engagement, employer satisfaction, and competency completion. Before any assessment can take place, the objectives of the VET program must be defined (Fretwell, 2007). Similar assessment measures in Europe were discussed as Tessaring and Wannan (2004) recommended all European VET programs follow the Common Quality Assurance Framework (CQAF), so they can

reinforce their efforts in developing coherent and systematic quality assurance programs. The CQAF "helps to develop, improve, monitor and evaluate national systems and practices, and provides a common reference system" (Tessaring & Wannan, 2004, p. 54).

Identifying High Quality Training Programs

Once a training program has met defined standards through the assessment process, it can be declared a quality program. At this point, the level that the program exceeded standards would help to define them as exemplary, or high quality. The literature varies greatly on how to recognize exemplary programs, but all start with meeting defined standards.

In 2001, the National Research Center for Career and Technical Education held a roundtable discussion with instructors from four high school CTE programs that met the criteria for a high-quality program as developed by its National Advisory Council. Through the discussion, the critical factors for identifying an exemplary secondary program were industry credentialing, use of data for program improvement, integration of academic and technical skills, and partnerships with business and industry (Budke et al., 2001). The No Child Left Behind Act of 2001 defined a high quality program as a program that can improve a learning outcome, utilize objective data, develop measurable goals and objectives, and implement scientifically based activities that meet identified needs.

The National Dissemination Center for Career and Technical Education followed this discussion with the release of a rubric for identifying exemplary secondary level CTE programs in 2002. This rubric consisted of four main criterions that included program goals, program content, standards, and partnerships/reform. Each criterion contained sub-sections that were to be scored on a four-point scale where one indicated a struggling

program and four indicated an exemplary program (National Dissemination Center for Career and Technical Education, 2002). This system generated quantitative data regarding the success of a program.

Three business awards, Malcolm Baldrige National Quality Award, the Deming Application Prize, and International Organization for Standardization (ISO) 9000 Registration, can be used as a blueprint to assess quality vocational education programs (Brown, 1997). The Baldrige Award focuses on customer satisfaction and retention, the Deming Prize rewards businesses who apply quality control methods based on statistical data, and the ISO 9000 Registration recognizes companies that meet the ISO's quality standards (Izadi, Kashef, & Stadt, 1996). The requirements and framework for these awards can be found in educational recognition awards throughout the country.

The Virginia Governor's Career and Technical Education Exemplary Standards Award follows some of the framework used in the three business models. Nominated secondary school programs are evaluated on three main areas that contain a total of 88 standards. Each program must submit quantitative data supporting the indicators. The standards are graded on a four-point scale where zero indicates missing evidence and three indicates excellent documentation. The main areas are program excellence, educational significance, and evidence of effectiveness and success (Virginia Career Education Foundation, 2011). The purpose of this award program is to raise the quality and rigor of CTE programs in Virginia.

Illinois' system for identifying exemplary secondary industrial technology programs is conducted through its Curriculum Revitalization Initiative [CRI] (Illinois Office of Educational Services, n.d). There are four main factors used to determine an exemplary program: employability; graduation rates; impact on business, industry, and

the community; and structure of curriculum materials. System directors and other stakeholders, such as business and industry, nominate programs.

Symonds et al. (2011) recognized three exemplary secondary school initiatives as models for CTE in its publication, *Pathways to Prosperity*. Project Lead The Way was recognized for introducing high school students to engineering. The Career Academy Movement combines college-prep with a career theme that includes work-based learning. High Schools That Work is a national effort to integrate academics and CTE. Massachusetts, California, Florida, and Washington were all recognized in the *Pathways to Prosperity* publication for their outstanding efforts to link academics and CTE.

Students can also identify an exemplary CTE program. Gentry, Rizza, Peters, and Hu (2005) found a Midwestern high school that had an unusually high satisfaction score in a previous study. The researchers found professionalism, sense of community, and reason to learn as the main factors why this school's CTE programs excelled. These factors could be duplicated at other schools with planning and deliberate actions.

Recognizing exemplary training programs can also be applied to CTE teacher training. Bruening et al. (2001) researched the factors that encompass exemplary CTE teacher programs. They identified four main indicators: field experiences, technology integration, academic integration, and quality teaching. The researchers hope these finding are used to improve the quality of CTE training programs nationwide.

Delphi Method

The Delphi technique, which originated in the 1950s at the Rand Corporation, was used as a forecasting tool for the military (Stitt-Ghodes & Crews, 2004). The purpose of a Delphi study was to gain a reliable consensus of opinions from a panel of experts (Dalkey & Helmer, 1963). The consensus can be used to validate a theoretical model or

to provide agreement on an idea that has not been previously researched.

The Delphi technique typically has three rounds of inquiry, with an unstructured first round so that the responses from the panelists are more open (Powell, 2003). Subsequent rounds ask the experts to rank what was revealed in the previous round. This portion of the study is critical as it provides the only feedback between the participants (Murphy et al., 1998). In the final round, the consensus will be obtained when the researcher's predetermined percentage of agreement is reached (Powell, 2003).

The first step in applying the Delphi method is the selection of a group of experts (Brown, 1968). A Delphi study differs from experimental research in that the panelists are not a statistical sample of the population (Delbeq, Van De Ven, & Gustafson, 1975). The panel is formed through a nominating process by a related association or with other identified individuals who have experience with the area being studied. The researcher's task is to define and justify the criteria for selecting panel experts in the study (Vernon, 2009). The researcher can identify target groups likely to have experience with the topic and ask them to nominate others within that group (Delbeq, Van De Ven, & Gustafson, 1975).

Expert panel members should be willing and able to provide meaningful contributions (Powell, 2003). The selection should not be a matter of the researcher's personal preference (Whillhelm, 2001). Experts who have interest in the findings may be willing participants, as well (Linstone & Turoff, 1975). The researcher must work with the nominating process to ensure that the panelists meet the specified selection criteria. The panelists are anonymous to each other but not to the researcher (Okoli & Pawlowski, 2004).

There is little consensus when it comes to the appropriate number of panelists

serving on a Delphi study. Some studies have had as few as ten panelists, while others had over 100 (Delbeq et al., 1975). A researcher must ensure that there are a high enough number of panelists as participant dropout is a hazard of Delphi methodology (Sackman, 1974). There is little empirical evidence on the relationship between the number of participants and the reliability or validity of consensus of the process (Murphy et al., 1998).

There are some pitfalls that a researcher must be aware of when assembling the panel. Judd (1972) warned that assembling a panel in higher education would result in a singular set of opinions due to their common background. Hasson and Keeney (2011) argue that anonymity cannot be guaranteed, and the panelists may be influenced, which would affect the validity of the responses.

The first round is designed to retrieve a response to a broad question and determine the opinions of the panelists. This round is characterized by the exploration of the topic being discussed, and the panelists provide additional insight for the issue (Linstone & Turoff, 1975). The panelists' responses will offer a wide spread of individual answers (Dalkey, 1969).

An open-ended questionnaire is most commonly used for feedback (Chia-Chien & Sandford, 2007). Hill and Fowles (1975) state, "a principal tenet of survey methods is that the research instrument and its component questions or event statements, must be carefully designed so as to provide unambiguous stimuli to the respondents" (p. 181). The researcher should construct a well-designed survey in order to avoid bias or skewed responses. The data obtained from round one are qualitative.

Hasson, Keeny, and McKenna (2000) suggest that the researcher should encourage the panelists to provide as many opinions as possible in the first round to

increase the chance of covering all aspects of the topic. However, they have found that researchers, in an effort to obtain a more manageable amount of data, have set limits on the number of opinions requested from the panelists. Some researchers recommend limiting the number of responses to six as panelists may select the same opinions using different terms (Schmidt, 1997). The limit on the number of responses can also be related to the number of panelists selected for the study. The researcher may wish to summarize the responses from the first round using textual and numerical depictions (Willhelm, 2001).

The researcher may choose to assemble a team to undertake and monitor the Delphi study (Taylor-Powell, 2002). This team may be necessary considering the amount of data that could be retrieved during the first round of the study. However, the success of the Delphi relies on the data collection and reporting skills of the researcher (Hasson, et al., 2000). The researcher may distribute the questionnaire to the panelists and collect the responses (Skulmoski, Hartman, & Khran, 2007). Responses are categorized and collated as needed by the researcher or the research team.

In the second round, the responses from the first round are collated and categorized (Beech, 1999). The panel of experts is asked to validate and rate the categories identified in the first round (Okoli & Pawlowski, 2004). The third round asks the panel to rate the categories again, knowing the results of the previous round. This portion of the study is critical as it provides the only feedback between the participants (Murphy et al., 1998). The rounds continue until the final round when consensus is reached by obtaining the researcher's predetermined percentage level of agreement (Powell, 2003). Delbecq et al. (1975) stated that the process could stop when the consensus has been approached among the respondents.

Willhelm (2001) stated that requiring more than three rounds of the study is dependent on the objectives and topics of the study. Researchers can continue to conduct subsequent rounds past the third round in an effort to try to increase the percentage of consensus. However, the amount of time required combined with the increased dropout rate of the participants may lead to a point of diminishing returns for the study (Hasson et al., 2000).

While the first round obtains qualitative data, there are various methods to quantify the results from the second and third rounds. Second and third rounds quantify the first round categorizations through rating or ranking techniques (Powell, 2003). When using statistical integration from the panel's assessments, a Likert scale is commonly used to facilitate calculations (Willhelm, 2001). Central tendencies and levels of dispersion are the most commonly-used methods. Judd (1972) recommends sorting the group responses using median and interquartile range. The median is preferred to the mean as the mean score may skew the results to one side.

Researchers have different opinions when it comes to statistical interpretation of consensus. Standard descriptive statistics and Kappa calculations, when combined with thematic analysis and the number of responses generated, can be used to demonstrate movement toward consensus and stability (Holey, Feely, Dixon, & Whittaker, 2007). Central tendencies and levels of dispersion, specifically standard deviation and interquartile range, are a preferred method with some researchers. Chia-Chien and Sandford (2007) stated that the mean, mode, and standard deviation are favored for drawing consensus. Schmidt (1997) recommends using Kendall's W coefficient of concordance for determining consensus. Scheibe, Skutsch, and Shofer (1975) stated, "in most Delphis, consensus is assumed to have been achieved when a certain percentage of

the votes fall within a prescribed range - for example, when the interquartile range is no larger than two units on a ten-unit scale" (p. 277). English and Kernan (1976) suggested the use of the coefficient of variance (CV) as the criterion for determining consensus when the CV is less than or equal to 0.5.

The techniques for drawing conclusions in Delphi studies are debated amongst researchers. Schmidt (1997) stated that there is no consistent method for reporting findings in a Delphi study. Some researchers determine the conclusions once the number of rounds has been completed. Others will draw their conclusions once the predetermined level of consensus is reached. The conclusions reached in the study are based on the statistical methods used to determine consensus in the final round of the study. The interpretations of the findings help to identify the areas that the panel of experts considers important in relation to the topic researched by the study (Hasson et al., 2000). However, Sackman (1975) challenges this notion by stating that researchers who engage in Delphi studies base their conclusions on a manipulated consensus, which narrows the dispersion of opinion.

Summary

The literature review for this study was to explain program standards that can be used to establish high quality postsecondary trade and industrial education programs. The research objectives guiding this study regard the need of standards and their descriptions for determining the effectiveness of a postsecondary trade and industrial program.

The review of literature included a history of trade and industrial education. Key legislation that impacted CTE over the last 100 years was reviewed along with major trends in workforce education. Most notably, how the nation's workforce needs evolved

and impacted the direction of trade programs was explained. The country's expectations for workforce training determined which initiatives were funded and how the training schools adapted to meet these demands.

Postsecondary education's role in trade and industrial education was reviewed in the next section. These institutions can offer credit and non-credit training depending on the needs of the industry. Student expectations of postsecondary training outcomes can vary. These expectations included earning a degree, obtaining an industry credential, or updating job skills, all of which can determine the length of time they are in a program. A labor market need along with industry partnership also drives postsecondary training outcomes.

The use of standards for training programs is either program based or skill based. Program based standards can be used for all aspects of training program development. Skill based standards are the actual competencies the learner will master. Standards can be implemented in various types of training programs, such as CTE teacher training and apprenticeship programs. Development of standards for CTE programs can be established with the help of business and industry. Some states create their own standards while others use standards developed by the National Skills Standards Board. Other nations' VET programs rely on standards to guide program outcomes.

Assessment measures must be put into place in order to determine if a program is successfully meeting approved standards. Different factors of assessment are used based on the type of training that is being administered. Additionally, different accrediting agencies and different states use various types of assessment factors to achieve the desired outcomes. While Perkins IV requires the collection of data, how the agency structures its assessment model is not standardized. Industry involvement is common in

CTE programs as the businesses work with the schools to ensure that the training aligns with the needs of the workforce.

Identifying high-quality programs is determined by the assessment method put into place by the agency making the determination. While schools and programs may meet the desired outcomes, those who exceed the minimum requirements may be labeled as exemplary (high-quality). The grading rubric for exemplary programs uses a set of criteria that is based on the desired outcomes of the agency.

A history and application of the Delphi method was discussed. The Delphi method's origin was with the military in the 1950s, but has been used in academic studies. This research study will utilize a Delphi method in order to gain a consensus among a panel of experts regarding the standards that should be applied to a postsecondary trade and industrial program. Chapter III will provide a detailed explanation on how the Delphi method will be conducted for this research project including panel selection, data collection, and data analysis.

CHAPTER III

METHODS AND PROCEDURES

This chapter discusses the methods and procedures used in this study. An explanation of the research design will be provided. The chapter will provide information regarding the Delphi panel, the procedures used to collect data, and the methods of data analysis.

Research Design

The chosen research method for this study was the Delphi technique, which employed a four round sequence to determine the standards that can be used to develop a high quality postsecondary trade and industrial education program. The Delphi technique provided a system and method of data collection using a panel of experts within this field. Using a survey method, panelists were asked to identify standards, including their descriptions, for establishing high quality trade and industrial education programs in the first round. The second round provided the panelists the opportunity to add any standards they felt were missing from the Round 1 list. The panel was asked to rate the importance of the standards in two subsequent rounds in order to determine consensus.

The Delphi method consists of a series of surveys during which the panelists receive feedback based on the previous rounds in order to allow them to reevaluate their previous responses. This method provides a controlled interaction between the researcher and the participants and avoids the disadvantages of a round table discussion (Dalkey & Helmer, 1963). The Delphi technique has the ability to obtain opinions and consensus from a diverse group of participants (Stitt-Ghodes & Crews, 2004). Through the four rounds, the results from the panelists will help to form a consensus on standards that can be used for designing and assessing high quality postsecondary trade and industrial

education programs.

Delphi Panel

The criteria for panelist selection of this Delphi study included postsecondary administrators who were responsible for trade and industrial education programs at their colleges and held membership in the Association of Career and Technical Education (ACTE). The panelists were invited to participate in the study by ACTE's Trade and Industrial Division in order to achieve a diverse range of expert opinions. Through ACTE's invitation the researcher projected that the panelists were representative of various programs that comprise the trade and industrial education program areas of CTE and worked at the community college level. The researcher obtained the responses from ACTE and reviewed the panelists' information to ensure all eight areas of trade and industrial education were represented. However, the invitation process did not yield a sufficient number of panelists. To ensure significant participation in the study, the researcher compiled a list of postsecondary trade and industrial administrators from institutions with multiple trade and industrial education programs and invited them to participate. The panelists who responded were from programs located throughout the United States. The researcher assembled a panel of 16 participants, two for each trade and industrial education area, to ensure a homogenous group with a sufficient number of respondents.

Being a member of a national organization of their peers can be considered a professional quality for an administrator. Organization members recognize the connection between themselves, their profession, and the organization that represents their profession (Ritz & Martin, 2013). This quality, along with their experience working with trade and industrial programs, defined the invited administrators as experts and

qualified to serve on the panel.

To ensure that the responses from each participant were their own, the names of the panelists were not revealed to the others who volunteered for this research project. The panelist information that was collected included the trade and industrial programs they are responsible for and the number of years in their position. To ensure consistent interactions with the panelists, the researcher was the only person contacting the participants during the study. For Round 1, the researcher utilized the online resource Survey Monkey™ as the data collection medium. This enabled the respondents to report their ideas anonymously. Subsequent rounds used e-mail communication between the researcher and the individual panelists.

Procedures and Data Analysis

Before the start of Round 1, a pilot study conducted with four administrators within the researcher's home state was undertaken to determine if the initial survey sufficiently yielded the desired responses. The pilot group was invited to complete the survey and provide feedback to the researcher. The pilot study participants also provided an assessment of the quality of the survey. Only four administrators were invited to participate in the pilot study, as the pool of administrators that met the criteria was limited.

Once the pilot study was completed and assessed, the Delphi panelists received a letter asking for their willingness to participate in the study. A copy of the letter of invitation is found in Appendix A. The panelists who agreed to participate were contacted via e-mail and provided with the purpose and timeline for the study. A copy of this communication is found in Appendix B.

In Round 1 the panelists received an overview that explained the purpose of the

study and the directions on how to proceed with the survey (see Appendix C). This correspondence provided a definition for standard, as well as a definition of a description of a standard, to assist panelists when making their decisions on the survey. The panelists were asked to complete an online survey asking them to list two standards along with the descriptions that they felt helped to define a high quality postsecondary trade and industrial education program.

A review board of three college administrators not associated with the study was asked to assist the researcher with the categorization of the responses (see Appendix D). These review board members had experience with program standards but did not work for the researcher. The review board reviewed the results from the first round of the survey and categorized the responses by standard similarities. The review board also determined common descriptions for each standard. They returned the reviewed standards and descriptions to the researcher in preparation for Round 2. The researcher then refined the standards and descriptions to ensure similarities in structure.

In Round 2 the panelists were e-mailed instructions (see Appendix E) along with the list of edited standards and descriptions generated through Round 1. The panelists were asked to add additional standards that they felt may have been missing from the Round 1 listings. The researcher edited the new standards and descriptions by applying the same methods used in Round 1.

Round 3 was designed to initiate the process of drawing consensus on the standards. The panelists were e-mailed the compiled list of standards generated in Round 2 and asked to rate the standards using a five-point Likert scale, with five being most important and one being least important. The panelists e-mailed the completed surveys back to the researcher.

Using measures of central tendencies, the ratings from all the surveys were compiled and analyzed. The scores were sorted using IBM's Statistical Package for the Social Sciences (SPSS) to determine the mean, median, standard deviation, and interquartile range (IQR). The IQR was used to determine the strength of consensus among the panelists for each standard. An IQR less than or equal to 2.0 and a mean score greater than or equal to 3.51 would indicate agreement among the panelists for the standard and it would be retained. The researcher chose these thresholds as they have been supported in other studies (Martin & Ritz, 2011; Roberts, 2013). These studies had similar measures and scales to this research study.

Round 4 was designed to further the process of drawing consensus on the standards identified by the panelists. The researcher e-mailed the panelists the list of standards generated through the previous round and would eliminate any standards that did not meet established statistical criteria. The panelists were also given the group mean, median, IQR, and standard deviation of the standards along with their individual rating scores. With this knowledge, they were then asked to review and re-rate the standards and e-mail their results back to the researcher.

SPSS was used to calculate the mean, median, standard deviation, IQR, and coefficient of variation (CV) of the fourth round results. A mean score greater than 3.51 and an IQR less than or equal to 2.0 would indicate consensus. The CV was used to determine the strength of the consensus. A CV less than or equal 0.50 would indicate a strong degree of consensus among the panelists (Kernan & English, 1976). The data collected in this round would then be used to report the findings of the panelists in regards to the research questions. If the standard had a mean score less than 3.51, an IQR greater than 2.0, or a CV higher than 0.50, it did not meet group consensus and was

discarded as a standard that could be used to identify a high quality postsecondary trade and industrial education program.

Summary

Chapter III provided a description of the Delphi technique used in this study. It discussed the procedures for data collection and analysis. This technique was utilized to develop consensus among the nominated panelists as to which standards can be used to identify a high quality postsecondary trade and industrial education program. The 16 panelists for this study were postsecondary trade and industrial education program administrators that were nominated to the panel of experts from their expertise and leadership in postsecondary trade and industrial education and their membership in the ACTE.

This Delphi study consisted of four rounds. Before the first round commenced, a pilot study was conducted to ensure the survey yielded the expected results. Round 1 asked each panelist to list standards they felt best represented a high quality postsecondary trade and industrial education program. An external, three-person review panel categorized the responses by similar standards and determined a common description for each standard. Round 2 gave the panelists an opportunity to add additional standards they felt were missing from the Round 1 list.

Rounds 3 and 4 were designed to generate a consensus among the panelists as to which standards could be used to determine high quality postsecondary trade and industrial education programs. Consensus for the standards was developed using descriptive statistics.

Chapter IV will discuss the findings of this study. The chapter will explain the statistical data collected and how consensus was reached among the panelists.

CHAPTER IV

FINDINGS

This chapter presents the findings for the research study. The four rounds of surveys were presented to the panelists from October 2014 to March 2015. This chapter will summarize the steps followed in each survey round and the responses collected from the panelists.

Round 1

The criteria for the panelists included postsecondary administrators responsible for trade and industrial education programs at their institutions and held membership in the Association for Career and Technical Education (ACTE). Before invitations were sent out to the potential panelists, four administrators within the researcher's home state agreed to participate in a pilot study. Two of the four (50%) participants completed the survey and indicated there were no issues with the survey as implemented.

On August 16, 2014, the ACTE's Trade and Industrial Division sent out invitations to their members who met the criteria set by the researcher. This process yielded six administrators willing to serve on the panel. In order to increase the pool of potential panelists, the researcher compiled a list of postsecondary administrators that were responsible for multiple trade and industrial education programs throughout the US. After invitations were sent out to 76 potential panelists, a total of 16 administrators agreed to participate. On October 10, 2014, the panelists were confirmed and the trade and industrial Career Clusters they were responsible for were recorded with two panelists representing each Career Cluster including (a) Architecture and Construction, (b) Arts, Audio/Visual Technology, and Communications, (c) Government and Public Administration, (d) Human Services, (e) Information Technology, (f) Law, Public Safety,

Correction, and Security, (g) Manufacturing, and (h) Transportation, Distribution, and Logistics.

Round 1 of the Delphi survey was presented to the panelists on October 13, 2014. Panelists were asked to complete the survey by no later than October 24, 2014. This round consisted of two sections. The first section asked the panelists for specific demographic information to confirm their expertise in trade and industrial education and to identify the variety of Career Clusters that they represented. Each panelist was asked to identify which postsecondary trade and industrial education Career Clusters they directed. They were allowed to select more than one area. Each panelist was also asked how many years he or she had been an administrator of these programs. In the second section of the survey the panelists were asked to provide two standards, along with their descriptions, that could be used to design and assess high quality postsecondary trade and industrial education programs.

In Round 1, 13 out of 16 (81%) surveys that were distributed were completed and returned by October 24, 2014. One panelist representing the transportation Career Cluster failed to submit a response to Round 1. Two panelists, one representing architecture and one representing manufacturing, submitted incomplete surveys. These surveys contained the specific demographic information, but did not include any standards or descriptions. These three panelists were withdrawn from the study.

The first section of the Round 1 survey revealed that many of the panelists were responsible for multiple trade and industrial education Career Clusters. The most common Career Cluster was transportation (10), followed by architecture and construction (7), manufacturing (7), arts, audio visual technology, and communications (6), human services (5), information technology (5), law, public safety, correction, and

security (5), and government and public administration (2). See Table 6.

Table 6

Panel Member Area of Responsibility by Career Cluster

Career Cluster	# of Responses
Architecture & Construction	7
Arts, A/V Technology, & Communications	6
Government & Public Administration	2
Human Services	5
Information Technology	5
Law, Public Safety, Correction, & Security	5
Manufacturing	7
Transportation, Distribution, & Logistics	10

Six of the panelists identified that they had six to ten years of experience as an administrator of a postsecondary trade and industrial education program. Two panelists had more than 21 years of experience. Three panelists had 16 to 20 years of experience. One panelist had 11 to 15 years of experience and one panelist had less than 6 years of experience. See Table 7.

Table 7

Number of Years as an Administrator of Postsecondary Trade and Industrial Education Programs

Number of Years	# of Responses
0-5	1

Table 7 (*continued*)

Number of Years	# of Responses
6-10	6
16-20	3
21 or more	2

In the second section of the Round 1 survey the panelists were instructed to provide two standards and their related descriptions that can be used to design and assess a high quality postsecondary trade and industrial education program. Table 8 lists the responses from the panelists. Appendix D lists the standards with their corresponding descriptions. The 13 panelists submitted a total of 26 standards and descriptions.

Table 8

Round 1 Standards

Standard
85% of students enrolled in workforce programs will be retained from the first quarter of enrollment to the second quarter of enrollment
Advisory committee is made up of industry reps from labor and management
Connection with industry norms
Contextualized learning
Curriculum and instructional planning
Curriculum relevance
Demonstrate knowledge of content areas and familiarity with state Department of Education pre-kindergarten standards

Table 8 (*continued*)

Standard
Demonstrate knowledge of theories of human growth, development, and learning related to children from birth to age eight
Demonstrated learning outcomes
Evidence based teaching strategies
Faculty meet professional and academic qualifications
Gainful employment
Independent problem solving
Industry credentials
Industry recognized curriculum
Instructional faculty/staff
Instructors must have balanced technical and academic backgrounds
Laboratory instruction
Meaningful employability
Programs are designed around rigorous college and career readiness standards.
Promote teaching and learning excellence through the preparation and certification of educators.
Qualified instructors
Soft skills
Team collaboration
Up to date equipment
Workforce program advisory committees rate the program graduates as "workforce ready"

Following the completion of the Round 1 survey, three individual college administrators not associated with the study were sent invitation letters to serve on a review board to assist the researcher in categorizing the responses. The review board members had experience with program standards but did not work for the researcher. The board reviewed the responses from the panelists and categorized the standards by similarities. This reduced the number of standards from 26 to 6. The board also developed common descriptions for each standard based on the panelists' input. The review board indicated there were several standards that had similar themes such as curriculum, faculty qualifications, and meeting industry standards. Table 9 shows the compiled list that was returned to the researcher in preparation for Round 2.

Round 2

In Round 2, each panelist was asked to review the categorized list of six standards from the review board and was asked to provide additional standards that they felt may have been missed in Round 1. On January 16, 2015, an e-mail was sent to the 13 panelists along with directions. All 13 panelists responded to this round (100%). Six panelists validated the categorized list as it was presented to them. Seven panelists provided additional standards and descriptions. Table 10 is a summary of the panelists' comments regarding additional standards.

With this input, a revised list consisting of 17 standards and descriptions was compiled in preparation for Round 3. The researcher edited the standards and descriptions using the same method used earlier by the review board. Table 11 shows the updated list of standards and descriptions.

Table 9

Categorized List of Standards by Review Board

Standard	Description
Advisory Committee is composed of representatives from the community, local industry, national sponsors, and state and national accrediting bodies	In order to ensure that programs are relevant to the economy, the committee needs to be from labor and management.
Faculty meet professional and academic qualifications	Instructors should have (as a minimum) an AAS in the field they are teaching and a minimum number of years practicing in the industry. Faculty are recognized professionals in the field, with appropriate industry standards certifications, and have expertise including best practices in delivering instruction and evaluating training.
Meaningful employability	The program content leads to long-term employment at a family sustainable wage.
Programs are designed around industry standards	Programs should be developed and continually validated in collaboration with secondary, postsecondary, and industry partners; incorporate essential knowledge and skills (e.g., academic skills, communication, problem solving), which students must master regardless of their chosen career area. Provide the same rigorous knowledge and skills in English and mathematics that employers and colleges expect of high school graduates; incorporate industry-recognized technical standards that are valued in the workplace; and to the extent practicable, be internationally benchmarked so that all students are prepared to succeed in a global economy.

Table 9 (*continued*)

Standard	Description
Soft skills	In addition to the technical skills related to completing specific tasks on the job, the program provides opportunities for students to master soft skills, such as punctuality, quality of work, communicating and collaborating with others, etc.

Table 10

Summary of Panelists' Comments Collected in Round 2

Comment
Curriculum and curriculum revision
Placement rates
Employer feedback
Focus on students moving from a 2-year to 4-year degree (student advancement)
Remediation structures for students who need some help
A majority of students that begin a program will complete it

Table 10 (*continued*)

Comment
Instructors should have as a minimum an AAS in the field they are teaching and a minimum number of years practicing in the industry for which they teach
Prepare students to take and pass licensure and/or industry accepted certification exams upon program completion
Advisory committee should be comprised of no less than five to eight members
All tools and equipment must meet OSHA regulations
All facilities will be inspected regularly to maintain compliance with applicable OSHA regulations
Student assessments must determine each student's technical skill attainment to relevant industry standards
Annual program review
Academic integration in program design

Table 11

Revised List of Standards and Descriptions for Round 3

Standard	Description
Academic Integration	Academic integration should provide the same rigorous knowledge and skills in English and mathematics that employers and colleges expect, and to the extent practicable, be internationally benchmarked so that all students are prepared to succeed in a global economy.
Advisory Committee	In order to ensure the program is relevant to industry, an advisory committee will make key recommendations regarding standards, critical competencies, technical skill attainment, assessments, facilities, and equipment. The committee will be comprised of applicable representatives from the community, local business and industry, national sponsors, and state and national accrediting bodies.
Curriculum	The program curriculum is designed to reflect the needs of industry and is subject to revision by the program advisory committee.
Employer Feedback	The program utilizes feedback from employers regarding the effectiveness of the training students receive and uses this feedback for program improvement.

Table 11 (*continued*)

Standard	Description
Faculty Qualifications	Faculty should have as a minimum an Applied Associate of Science or equivalent degree in the field they are teaching and a minimum number of years practicing in the industry for which they teach. Faculty are recognized professionals in the field with appropriate industry certifications. They have expertise in delivering instruction that includes best practices and training evaluation. The faculty follow a professional development plan that is designed to improve their effectiveness.
Meaningful Employability	The program content leads to long-term employment at a family sustainable wage.
Placement Rates	The program monitors the placement rates of their students to an acceptable level as determined by the advisory committee.
Program Design	Programs incorporate industry-recognized technical standards into their curriculum and training methods that are valued in the workplace and are continually validated in collaboration with secondary, postsecondary, and industry partners. Programs should be designed with lattices and ladders for student advancement opportunities.
Program Review	Programs will develop an annual written review process that will be used to assess program quality and performance and make recommendations for continuous improvement.
Safety	Safety is incorporated into all aspects of the program. Facilities and equipment will be regularly inspected in order to maintain compliance with applicable OSHA regulations. Instructors will complete OSHA safety training as per their industry. Safety is an integral part of the program curriculum.

Table 11 (*continued*)

Standard	Description
Soft Skills	In addition to the technical skills related to completing specific tasks on the job, the program provides opportunities for students to master soft skills, such as punctuality, quality of work, and communicating and collaborating with others.
Student Achievement of Industry Credential	The program prepares students to take and pass industry accepted certification and/or licensure exams.
Student Advancement	For those students in a two-year program seeking a four-year degree, a determination will be made regarding their readiness to transfer to a four-year institution.
Student Assessment	Student assessments must determine each student's technical skill attainment to relevant industry standards. Students should also demonstrate mastery of academic skills attainment regardless of their chosen career area.
Student Remediation	Remediation structures are in place for students that are found needing help with being successful in the academic or technical courses.
Student Retention	A majority of students that begin a program will complete it.
Tools and Equipment	The laboratories are equipped with up-to-date tools and equipment that are based upon the recommendation of the advisory committee. The equipment should be representative of what is utilized in the industry.

Round 3

Round 3 was designed to initiate the process of gaining consensus from the panelists regarding the standards and their related descriptions. On February 16, 2015, the panelists were sent e-mails along with a copy of the revised list of standards (see Appendix G). They were asked to rate their level of agreement on how each standard can be used to design and assess a high quality postsecondary trade and industrial education program using a five-point Likert scale. The replies were then translated to a numeric value (e.g., *strongly agree = 5 points, agree = 4 points, uncertain = 3 points, disagree = 2 points, strongly disagree = 1 point*). Descriptive statistics were used to determine the level of agreement amongst the panelists regarding each standard. The mean score represented the average of the level of agreement and the median described the central numeric value of the responses. The standard deviation represented the dispersion of the responses. A lower standard deviation would indicate a greater consensus amongst the panelists. The interquartile range was used to determine the strength of the consensus among the panelists. All 13 (100%) panelists provided feedback to the survey for each standard. The following are the results of the Round 3 surveys.

Standard 1 was Academic Integration. The thirteen members rated this standard, which resulted in a mean score of 4.38, a median score of 5.00, a standard deviation (*SD*) of 0.87, and an interquartile range (*IQR*) of 1.00.

Standard 2 was Advisory Committee. The thirteen responses generated a mean score of 4.69, a median score of 5.00, a standard deviation (*SD*) of 0.48, and an interquartile range (*IQR*) of 1.00.

Curriculum was Standard 3 and it was rated by the thirteen panelists. The mean score was 4.00, the median was 4.00, the standard deviation (*SD*) was 1.08, and the

interquartile range (*IQR*) was 1.00.

Standard 4 was Employer Feedback. The thirteen panelists rated this standard. The mean score was 4.69, the median was 5.00, the standard deviation (*SD*) was 0.48, and the interquartile range (*IQR*) was 1.00

Standard 5 was Faculty Qualifications. The thirteen panelists scored this standard as follows: the mean score was 4.23, the median score was 4.00, the standard deviation (*SD*) was 0.83, and the interquartile range (*IQR*) was 1.00.

Standard 6 was Meaningful Employment. The results from the thirteen panelists revealed that the mean was 4.38, the median was 5.00, the standard deviation (*SD*) was 0.96, and the interquartile range (*IQR*) was 1.00.

Placement Rates was Standard 7. It was rated by the thirteen panelists. The mean score was 3.77, the median score was 4.00, the standard deviation (*SD*) was 1.09, and the interquartile range (*IQR*) was 2.00.

Standard 8 was Program Design. The thirteen panelists rated this standard, which resulted in a mean score of 4.54, a median score of 5.00, a standard deviation (*SD*) of 0.88, and an interquartile range (*IQR*) of 1.00.

Standard 9 was Program Review. The results from the thirteen panelists revealed that the mean was 4.38, the median was 4.00, the standard deviation (*SD*) was 0.65, and the interquartile range (*IQR*) was 1.00.

Standard 10 was Safety. The thirteen panelists reviewed this standard. The mean score was 4.92, the median score was 5.00, the standard deviation (*SD*) was 0.28, and the interquartile range (*IQR*) was 0.00.

Soft Skills was Standard 11. The thirteen panelists rated this standard, which resulted in a mean score of 4.85, a median score of 5.00, a standard deviation (*SD*) of

0.38, and an interquartile range (*IQR*) of 0.00.

Standard 12 was Student Achievement of Industry Credentials. The thirteen panelists rated this standard as follows: the mean score was 4.69, the median score was 5.00, the standard deviation (*SD*) was 0.48, and the interquartile range (*IQR*) was 1.00.

Standard 13 was Student Advancement. The thirteen panelists rated this standard. The mean score was 3.46, the median score was 4.00, the standard deviation (*SD*) was 0.88, and the interquartile range (*IQR*) was 1.00.

Standard 14 was Student Assessment. The thirteen panelists rated this standard, which resulted in a mean score of 4.69, a median score 5.00, a standard deviation (*SD*) of 0.48, and an interquartile range (*IQR*) of 1.00.

Student Remediation was Standard 15. The thirteen panelists rated this standard as follows: the mean score was 4.31, the median score was 4.00, the standard deviation (*SD*) was 0.63, and the interquartile range (*IQR*) was 1.00.

Standard 16 was Student Retention. The thirteen responses from the panelists resulted in a mean score of 4.23, a median score of 4.00, a standard deviation *(SD)* of 0.44, and an interquartile range (*IQR*) of 0.00.

Finally, Standard 17 was Tools and Equipment. The thirteen panelists rated this standard as follows: the mean score was 4.89, the median score was 5.00, the standard deviation (*SD*) was 0.48, and the interquartile range (*IQR*) was 1.00. Table 12 provides a summary of these data.

Table 12

Round 3 Summary of Standards

Item	Standards	*n*	*M*	*Mdn*	*SD*	*IQR*
1	Academic Integration	13	4.38	5.00	0.87	1.00
2	Advisory Committee	13	4.69	5.00	0.48	1.00
3	Curriculum	13	4.00	4.00	1.08	1.00
4	Employer Feedback	13	4.69	5.00	0.48	1.00
5	Faculty Qualifications	13	4.23	4.00	0.83	1.00
6	Meaningful Employment	13	4.38	5.00	0.96	1.00
7	Placement Rates	13	3.77	4.00	1.09	2.00
8	Program Design	13	4.54	5.00	0.88	1.00
9	Program Review	13	4.38	4.00	0.65	1.00
10	Safety	13	4.92	5.00	0.28	0.00
11	Soft Skills	13	4.85	5.00	0.38	0.00
12	Student Achievement of Industry Credentials	13	4.69	5.00	0.48	1.00
13	Student Advancement	13	3.46	4.00	0.88	1.00
14	Student Assessment	13	4.69	5.00	0.48	1.00
15	Student Remediation	13	4.31	4.00	0.63	1.00
16	Student Retention	13	4.23	4.00	0.44	0.00
17	Tools and Equipment	13	4.69	5.00	0.48	1.00

Round 4

Round 4 was intended to further the process of achieving consensus on the standards and descriptions developed by the panelists. On March 10, 2015, the panelists were sent an e-mail with a copy of the list of standards developed in Round 2 and rated in Round 3 (see Appendix I). They were also given the descriptive statistics from Round 3 and their own individual responses. Panelists were asked to re-rate their level of agreement on how each standard can be used to design and assess a high quality postsecondary trade and industrial education program using the same five-point Likert scale from Round 3. All 13 remaining panelists responded to the survey for a 100% response rate.

As Round 4 was designed to establish consensus amongst the panelists, the coefficient of variance (CV) would be calculated for each standard along with the mean, median, standard deviation, and interquartile range. A CV less than or equal to 0.50 and an IQR less than or equal to 2.0 would indicate consensus has been reached among the panelists. Following are the results of the Round 4 surveys.

Standard 1 was Academic Integration. The thirteen members rated this standard, which resulted in a mean score of 4.69, a median score of 5.00, a standard deviation (*SD*) of 0.48, an interquartile range (*IQR*) of 1.00, and a coefficient of variance (*CV*) of 0.10.

Standard 2 was Advisory Committee. The thirteen responses generated a mean score of 4.85, a median score of 5.00, a standard deviation (*SD*) of 0.38, an interquartile range (*IQR*) of 0.00, and a coefficient of variance (*CV*) of 0.08.

Curriculum was Standard 3. It was rated by the thirteen panelists. The mean score was 4.15, the median was 4.00, the standard deviation (*SD*) was 0.80, the interquartile range (IQR) was 1.00, and the coefficient of variance (*CV*) was 0.19.

Standard 4 was Employer Feedback. The thirteen panelists rated this standard. The mean score was 4.69, the median was 5.00, the standard deviation (*SD*) was 0.48, the interquartile range (*IQR*) was 1.00, and the coefficient of variance (*CV*) was 0.10.

Standard 5 was Faculty Qualifications. The thirteen panelists scored this standard as follows: the mean score was 4.38, the median score was 4.00, the standard deviation (*SD*) was 0.51, the interquartile range (*IQR*) was 1.00, and the coefficient of variance (*CV*) was 0.12.

Standard 6 was Meaningful Employment. The results from the thirteen panelists revealed that the mean was 4.46, the median was 5.00, the standard deviation (*SD*) was 0.66, the interquartile range (*IQR*) was 1.00, and the coefficient of variance (*CV*) was

0.15.

Placement Rates was Standard 7. It was rated by the thirteen panelists. The mean score was 3.92, the median score was 4.00, the standard deviation (*SD*) was 0.95, the interquartile range (*IQR*) was 2.00, and the coefficient of variance (*CV*) was 0.24.

Standard 8 was Program Design. The thirteen panelists rated this standard, which resulted in a mean score of 4.77, a median score of 5.00, a standard deviation (*SD*) of 0.44, an interquartile range (*IQR*) of 1.00, and a coefficient of variance (*CV*) of 0.09.

Standard 9 was Program Review. The results from the thirteen panelists revealed that the mean was 4.38, the median was 4.00, the standard deviation (*SD*) was 0.65, the interquartile range (*IQR*) was 1.00, and the coefficient of variance (*CV*) was 0.15.

Standard 10 was Safety. The thirteen panelists reviewed the standard. The mean score was 4.92, the median score was 5.00, the standard deviation (*SD*) was 0.28, the interquartile range (*IQR*) was 0.00, and the coefficient of variance (*CV*) was 0.06.

Soft Skills was Standard 11. The thirteen panelists rated this standard, which resulted in a mean score of 4.92, a median score of 5.00, a standard deviation (*SD*) of 0.28, an interquartile range (*IQR*) of 0.00, and a coefficient of variance (*CV*) of 0.06.

Standard 12 was Student Achievement of Industry Credentials. The thirteen panelists rated this standard as follows: the mean score was 4.54, the median score was 5.00, the standard deviation (*SD*) was 0.66, the interquartile range (*IQR*) was 1.00, and the coefficient of variance (*CV*) was 0.15.

Standard 13 was Student Advancement. The thirteen panelists rated this standard. The mean score was 3.62, the median score was 4.00, the standard deviation (*SD*) was 0.77, the interquartile range (*IQR*) was 1.00, and the coefficient of variance (*CV*) was 0.21.

Standard 14 was Student Assessment. The thirteen panelists rated this standard, which resulted in a mean score of 4.77, a median score 5.00, a standard deviation (*SD*) of 0.44, an interquartile range (*IQR*) of 0.00, and a coefficient of variance (*CV*) of 0.09.

Student Remediation was Standard 15. The thirteen panelists rated this standard as follows: the mean score was 4.23, the median score was 4.00, the standard deviation (*SD*) was 0.60, the interquartile range (*IQR*) was 1.00, and the coefficient of variance (*CV*) was 0.14.

Standard 16 was Student Retention. The thirteen responses from the panelists resulted in a mean score of 4.23, a median score of 4.00, a standard deviation (*SD*) of 0.44, an interquartile range (*IQR*) of 0.00, and a coefficient of variance (*CV*) of 0.10.

Finally, Standard 17 was Tools and Equipment. The thirteen panelists rated this standard as follows: the mean score was 4.77, the median score was 5.00, the standard deviation (*SD*) was 0.44, the interquartile range (*IQR*) was 0.00, and the coefficient of variance (*CV*) was 0.09.

Each standard achieved a mean score greater than 3.51, a median score greater than or equal to 4.00, a standard deviation (*SD*) less than 1.00, an interquartile range (*IQR*) less than or equal to 2.0, and a coefficient of variance (*CV*) less than 0.50. Therefore, consensus by the panelists had been reached for all 17 standards. Table 13 provides a summary of data.

Table 13

Round 4 Summary of Standards

Item	Standards	*n*	*M*	*Mdn*	*SD*	*IQR*	*CV*
1	Academic Integration	13	4.69	5.00	0.48	1.00	0.10
2	Advisory Committee	13	4.85	5.00	0.38	0.00	0.08
3	Curriculum	13	4.15	4.00	0.80	1.00	0.19
4	Employer Feedback	13	4.69	5.00	0.48	1.00	0.10
5	Faculty Qualifications	13	4.38	4.00	0.51	1.00	0.12
6	Meaningful Employment	13	4.46	5.00	0.66	1.00	0.15
7	Placement Rates	13	3.92	4.00	0.95	2.00	0.24
8	Program Design	13	4.77	5.00	0.44	0.00	0.09
9	Program Review	13	4.38	4.00	0.65	1.00	0.15
10	Safety	13	4.92	5.00	0.28	0.00	0.06
11	Soft Skills	13	4.92	5.00	0.28	0.00	0.06
12	Student Achievement of Industry Credentials	13	4.54	5.00	0.66	1.00	0.15
13	Student Advancement	13	3.62	4.00	0.77	1.00	0.21
14	Student Assessment	13	4.77	5.00	0.44	0.00	0.09
15	Student Remediation	13	4.23	4.00	0.60	1.00	0.14
16	Student Retention	13	4.23	4.00	0.44	0.00	0.10
17	Tools and Equipment	13	4.77	5.00	0.44	0.00	0.09

Summary

The purpose of this research study was to identify standards that could be used to determine high quality postsecondary trade and industrial education programs. Through the four rounds of the Delphi technique, the panelists identified the standards and came to consensus of agreement regarding the use of the standards to define a high quality program.

Round 1 of the study had the Delphi panelists, consisting of postsecondary administrators, develop a list of standards and descriptions for postsecondary trade and industrial programs. Thirteen panelists submitted 26 standards with their accompanying descriptions. A review board categorized the standards, combining similar responses,

and providing a common description for each standard. The review board reduced the list to six standards.

Round 2 asked the panelists to review the categorized list and provide additional standards they determined were needed to be added to the list. This additional input was used to compile a list of 17 standards with descriptions that would be used for the third and fourth Delphi rounds.

The third and fourth rounds were used to develop consensus among the panelists regarding the standards. In the third round, the panelists were asked to rate the standards on a five-point Likert scale. Descriptive statistics were used to determine the strength of the consensus. The fourth round was used to further the process of developing consensus. The panelists were given the descriptive statistics from the third round along with their responses and asked to re-rate the standards. Descriptive statistics along with the coefficient of variance was used to determine group consensus.

Chapter V will discuss the summary and conclusions of this study. Based on the findings of this study, the researcher will provide recommendations for the use of the standards to develop and assess high quality postsecondary trade and industrial education programs and further research.

CHAPTER V

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

This research study sought to identify standards that could be used to design and assess high quality postsecondary trade and industrial education programs. This chapter will summarize the study, offer conclusions based on the data collected, and provide recommendations for use of the results in postsecondary trade and industrial education.

Summary

In today's economy, the need for a skilled labor force has become a great necessity. Postsecondary institutions have become the focus for training the current and mid-skilled workforce (Bragg, 2001). While students pursue a four-year degree, many must be retrained for a technical skill in order to pursue a wage-earning career (Grubb, 1996). Additionally, employers are seeking skilled and credentialed workers for the workforce. Postsecondary schools are taking on a larger role in filling this need. They are providing the industry credentials and skill development for new and existing workers (Jacobs, 2001).

The question that arises from this development is: How does industry ensure that schools are providing workers who are trained to industry standards? Postsecondary institutions must meet accrediting agency standards. Secondary schools are required to meet state standards for student achievement. However, program standards for trade and industrial education programs vary amongst the programs. Some programs do not adhere to any standards. This study was designed to identify standards for designing and assessing postsecondary trade and industrial education programs. Once these standards have been established, institutions can use them to develop and assess their programs which will improve the delivery of trade and industrial education.

The problem of this study was to develop standards that can be used as a basis for establishing high quality postsecondary trade and industrial education programs. Two research objectives were developed to guide this research study. They were:

RO_1: Develop a set of program standards to be used to establish high quality postsecondary trade and industrial education programs.

RO_2: Develop descriptors that can be used to assess achievement of high quality postsecondary trade and industrial education programs.

These standards could then be used to design and assess trade and industrial education programs. Postsecondary institutions can develop the high quality training programs that meet these standards in order to produce better skilled workers needed by employers.

There were three limitations to the study. First, the study only investigated standards for postsecondary trade and industrial programs. It does not account for similar secondary education programs. Second, the study only focused on trade and industrial education Career Clusters such as construction, manufacturing, and transportation. The study does not factor in other program majors. Third, the panelists are administrators of postsecondary trade and industrial programs. Business and industry representatives, faculty, and students were not included.

The Delphi technique was implemented for this study to provide a method of data collection using a panel of experts. This technique is designed to obtain opinions and consensus from a group of participants (Sitt-Ghodes & Crews, 2004). Each panelist was not made aware of the names and locations of their fellow panelists and only interacted with the researcher. This way group consensus on a topic was achieved without pressure or bias that can occur in round table discussions (Dalkey & Helmer, 1963).

The panelists for this study were postsecondary administrators responsible for

trade and industrial education programs and members of the Association for Career and Technical Education (ACTE). Invitations were sent by the ACTE to members who fit these criteria. However, only six administrators responded. In order to ensure that each of the eight trade and industrial areas was represented, the researcher sent additional invitations to 76 potential panelists who were administrators at postsecondary institutions with multiple trade and industrial education programs. After the additional invitations were sent, a panel of 16 administrators agreed to participate in the study.

Round 1 of the study was conducted using an online survey and it consisted of two sections. The first section asked the panelists to identify which trade and industrial programs they were responsible. The panelists had the opportunity to select more than one area if they administered multiple trade and industrial programs. They were also asked how many years they had been an administrator of a trade and industrial program. This information was used to validate the panelists' qualifications. The second section of the Round 1 survey asked the panelists to provide two standards with descriptions that they felt could be used to design and assess a high quality postsecondary trade and industrial education program. Thirteen out of the 16 invited panelists provided 26 standards and descriptions (81%). One panelist each from architecture, manufacturing, and transportation failed to complete the survey and were withdrawn from the study.

Once data were collected from Round 1, a review board consisting of three postsecondary administrators familiar with program standards, but not associated with the study, was invited by the researcher to review and categorize the responses. The review board members categorized the similar standards and provided common descriptions for each one. The review board condensed the number of standards from 26 to 6.

In Round 2, the panelists were e-mailed the categorized list and asked if there

were additional standards that needed to be added to the list. Six of the panelists validated the categorized list. Seven of the panelists provided additional standards and descriptions. These additional standards and descriptions were categorized with the original list by the researcher using the same method used by the review board. The final list consisted of 17 standards and descriptions.

Round 3 started the process of building consensus amongst the panelists regarding the standards and descriptions. The panelists were e-mailed an explanation letter with a survey and asked to rate their level of agreement that each standard can be used to design and assess a high quality postsecondary trade and industrial education program using a five-point Likert scale (*5 = strongly agree, 4 = agree, 3 = uncertain, 2 = disagree, 1= strongly disagree*). All thirteen panelists responded to the survey (100%).

Round 4 was designed to further the process of building consensus among the panelists regarding the standards and descriptions. In this round, each panelist was e-mailed a survey similar to the one used in Round 3, but it included the descriptive statistics (mean, median, standard deviation, interquartile range) for each standard compiled in Round 3 along with their previous individual responses. The panelists were then asked to re-rate the standards. All 13 panelists responded to the survey (100%). After the round was completed, all 17 standards had a mean score greater than 3.51, a median score greater than or equal to 4.00, a standard deviation (SD) less than 1.00, an interquartile range (IQR) less than 2.00, and a coefficient of variance (CV) less than or equal to 2.50. Based on the results, the panelists had reached consensus on the standards that can be used to define and assess a high quality postsecondary trade and industrial education program.

Conclusions

The problem of this study was to develop standards that can be used as a basis for establishing high quality postsecondary trade and industrial education programs. To address this problem, two research objectives were developed.

Standards for trade and industrial programs vary between the different programs, if they even exist at all. Therefore, RO_1 was: Develop a set of program standards to be used to establish high quality postsecondary trade and industrial education programs.

Through the four rounds of the Delphi study, a consensus was reached among the panelists for all 17 standards. All standards met the criteria determined by the researcher for consensus. Each standard had a mean score greater than 3.51, an interquartile range (IQR) less than or equal to 2.0, and a coefficient of variation less than or equal to 0.50 (see Table 14).

As the panelists represented all eight trade and industrial areas, their recommendations and consensus show the standards can be applied to any of the eight areas of trade and industrial education which includes (a) Architecture and Construction, (b) Arts, Audio/Visual Technology, and Communications, (c) Government and Public Administration, (d) Human Services, (e) Information Technology, (f) Law, Public Safety, Correction, and Security, (g) Manufacturing, and (h) Transportation, Distribution, and Logistics. Regardless of the program area, the standards can be applied to develop a high quality program. Additionally, these areas are consistent with some trade and industrial program existing accreditation standards such as the National Automotive Technicians Education Foundation (NATEF) automotive standards and the American Council for Construction Education's (ACCE) construction standards.

Table 14

Standards and Descriptions for Postsecondary Trade and Industrial Education Programs

Item	Standard	Description				
1	Academic Integration	Academic integration should provide the same rigorous knowledge and skills in English and mathematics that employers and colleges expect, and to the extent practicable, be internationally benchmarked so that all students are prepared to succeed in a global economy.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.69	5.00	0.48	1.00	0.10
2	Advisory Committee	In order to ensure the program is relevant to industry, a committee will make key recommendations regarding standards, critical competencies, technical skill attainment, assessments, facilities, and equipment. The committee will be comprised of applicable representatives from the community, local business and industry, national sponsors, and state and national accrediting bodies.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.85	5.00	0.38	0.00	0.08
3	Curriculum	The program curriculum is designed to reflect the needs of industry and is subject to revision by the program advisory committee.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.15	4.00	0.80	1.00	0.19
4	Employer Feedback	The program utilizes feedback from employers regarding the effectiveness of the training students receive and uses this feedback for program improvement.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.69	5.00	0.48	1.00	0.10

Table 14 (*continued*)

Item	Standard	Description				
5	Faculty Qualifications	Faculty should have as a minimum an Applied Associate of Science or equivalent degree in the field they are teaching and a minimum number of years practicing in the industry for which they teach. Faculty are recognized professionals in the field with appropriate industry certifications. They have expertise in delivering instruction that includes best practices and training evaluation. The faculty follow a professional development plan that is designed to improve their effectiveness.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.38	4.00	0.51	1.00	0.12
6	Meaningful Employability	The program content leads to long-term employment at a family sustainable wage.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.46	5.00	0.66	1.00	0.15
7	Placement Rates	The program monitors the placement rates of their students to an acceptable level as determined by the advisory committee.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		3.92	4.00	0.95	2.00	0.24
8	Program Design	Programs incorporate industry-recognized technical standards into their curriculum and training methods that are valued in the workplace and are continually validated in collaboration with secondary, postsecondary, and industry partners. Programs should be designed with lattices and ladders for student advancement opportunities.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.77	5.00	0.44	0.00	0.09

Table 14 (*continued*)

Item	Standard	Description				
9	Program Review	Programs will develop an annual written review process that will be used to assess program quality and performance and make recommendations for continuous improvement.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.38	4.00	0.65	1.00	0.15
10	Safety	Safety is incorporated into all aspects of the program. Facilities and equipment will be regularly inspected in order to maintain compliance with applicable OSHA regulations. Instructors will complete OSHA safety training as per their industry. Safety is an integral part of the program curriculum.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.92	5.00	0.28	0.00	0.06
11	Soft Skills	In addition to the technical skills related to completing specific tasks on the job, the program provides opportunities for students to master soft skills, such as punctuality, quality of work, and communicating and collaborating with others.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.92	5.00	0.28	1.00	0.06
12	Student Achievement of Industry Credentials	The program prepares students to take and pass industry accepted certification and/or licensure exams.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.54	5.00	0.66	1.00	0.15
13	Student Advancement	For those students in a two-year program seeking a four-year degree, a determination will be made regarding their readiness to transfer to a four-year institution.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		3.62	4.00	0.77	1.00	0.21

Table 14 (*continued*)

Item	Standard	Description				
14	Student Assessment	Student assessments must determine each student's technical skill attainment to relevant industry standards. Students should also demonstrate mastery of academic skills attainment regardless of their chosen career area.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.77	5.00	0.44	0.00	0.09
15	Student Remediation	Remediation structures are in place for students that are found needing help with being successful in the academic or technical courses.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.23	4.00	0.60	1.00	0.14
16	Student Retention	A majority of students that begin a program will complete it.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.23	4.00	0.44	0.00	0.10
17	Tools and Equipment	The laboratories are equipped with up-to-date tools and equipment that are based upon the recommendation of the advisory committee. The equipment should be representative of what is utilized in the industry.				
		M	*Mdn*	*SD*	*IQR*	*CV*
		4.77	5.00	0.44	0.00	0.09

The panelists identified standards which included advisory committee, curriculum, faculty qualifications, and tools and equipment. The same four standards are used by NATEF (2012) to accredit secondary and postsecondary automotive technology programs. The ACCE's (2011) non-degree recognition program standards outlines 17 specific standards related to their industry. Of the standards established by the Delphi panel, curriculum, program design, and program review are all standards used by the ACCE.

Additionally, the standards needed to have descriptions to explain the function of the standard so that the assessment process could be properly followed. Therefore, RO_2 was: Develop descriptors that can be used to assess achievement of high quality postsecondary trade and industrial education programs. The panelists developed the descriptions and came to consensus regarding all 17 standards. Once again, all eight trade and industrial areas had representation on the panel. This shows the results from the study can be applied to all postsecondary trade and industrial program.

The descriptions from this study can also be found in notable literature related to trade and industrial education. The Carl D. Perkins Act of 2006 set performance indicators for postsecondary schools that also align with the findings in this study. The descriptions for program design, student achievement of industry credentials, and student advancement align with the Perkins Act (Brustein, 2006). Some of the descriptions in the study mirror Prosser's sixteen theories of vocational education. The descriptions for faculty qualifications, meaningful employment, program design, and tools and equipment align with Prosser's theories (Gordon, 2014). As businesses need more skilled workers, the demand for trade and industrial education programs will increase. Administrators representing all areas of trade and industrial education developed the standards and

descriptions for this study. Research studies such as this one can help outline the structure and assessment methods for high quality programs that meet industry needs.

Recommendations

The problem of this study was to develop standards that can be used as a basis for establishing high quality postsecondary trade and industrial education programs. The results of this study have led to recommendations for applying these results and recommendations for further research.

Some postsecondary trade and industrial programs struggle to produce qualified workers for their related industry. The existing programs deliver the curriculum, but they do not meet the needs of their local businesses. For postsecondary administrators responsible for trade and industrial programs, this study can provide the framework they can use to assess their existing programs. Using the standards and descriptions developed by the panelists, the postsecondary institution can assess their current programs. School administrators can provide an annual report that describes the success of a program based on the standards. If the program is currently not meeting the standard, the administration, along with the faculty and local businesses, can address the issues and make improvements based on the descriptions attached to the standard. Once the changes have been implemented, the administrator, faculty, businesses, and students can provide input through a review process that utilizes the descriptions of the specific standards to ensure the program is of high quality.

A program advisory committee can conduct an independent assessment of the program using the standards. The assessment by local businesses can be used to inform the program administrator of the strengths and weakness of the program and provide an opportunity to make recommendations that can lead to a high quality postsecondary trade

and industrial education program.

Postsecondary institutions are sometimes challenged with meeting industry needs that they are not currently serving. For the administrator who must oversee the development of a new program to meet these needs, the results of this study can provide a framework that can be used to develop the program. The new program structure can be created using the standards, with the all the related program requirements (faculty, equipment, curriculum, etc.) developed using the descriptions provided. Once the program has been launched and given time to develop, the descriptions can be used to assess the program's effectiveness in the same way an existing program would be assessed.

While these standards can be applied to any program, an administrator must be mindful of existing program accreditation standards that may exist within the specific trade. The findings from this study are not intended to be a replacement for existing standards. They can be a complement to those standards. Where a program does not have recognized industry standards, the standards and descriptions from this study can be utilized.

Future research should be conducted to substantiate the validity of the standards developed from this research. A pilot study that utilizes these standards in a trade and industrial education program should be conducted to test the effectiveness of the standards on the program outcomes. Various trade and industrial education stakeholder groups, such as business and industry representatives, postsecondary faculty members, or postsecondary students enrolled in trade and industrial programs, should provide feedback on the results of the pilot study, provide input on how to assess the results, and make recommendations to improve the model. An assessment instrument should be

developed and applied to the program that utilizes the standards. Additional studies should be conducted to revisit and refine the standards over a period of time using the assessment instrument on trade and industrial education program models that use the standards.

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APPENDIX A

Delphi Nomination Panel Request

August 16, 2014

Dear Xxxxxxxx,

Through your experience with postsecondary trade and industrial programs, and your membership with the Association for Career and Technical Education, you have been identified as a possible panel participant for a study that will seek to determine standards that can be used to define high quality postsecondary trade and industrial education programs. Once these standards have been established, institutions may use them to develop and assess their programs and thus improve the delivery of trade and industrial education.

As an expert in your field, your input will greatly impact future postsecondary trade and industrial program development. Your participation in the study is voluntary. However, your opinions and insight would add significant benefit to this study. If you decide to participate, your identification and your school's identification will remain confidential, as all of the data reported will be in summative form.

This study will use a four round Delphi technique. If you agree to participate in this study, I will e-mail you a Round 1 survey with instructions. The first round of the study will commence one week after the panel is assembled, approximately the second week of September 2014. The study should be completed by February 2015. Participation in each round should only require approximately15 minutes of your time. At the end of the study, it is hoped the panelists will reach consensus on the standards that define a high quality trade and industrial education program.

Participation in this study does not include any direct personal benefit. You are not required to remain in the study and can withdraw at any time without penalty. If you decide to accept this invitation, please reply to Beno Rubin at brubi003@odu.edu by August 30, 2014. Please include which postsecondary trade and industrial programs you are responsible with your response.

Sincerely,

Beno Rubin

Beno Rubin
PhD Candidate, STEM Education & Professional Studies
Old Dominion University

John M. Ritz

John M. Ritz
Professor, STEM Education & Professional Studies
Old Dominion University

APPENDIX B

Round 1 Cover Letter

October 13, 2014

Dear xxxxxxxx,

Thank you for agreeing to participate in this study on Determining Program Standards for Establishing High Quality Postsecondary Trade and Industrial Education Programs. We appreciate your response to our invitation and are grateful for your willingness to contribute to our study.

Through the four survey rounds of this study, it is hoped that you and the other panelists will come to a consensus on the standards. Attached to this email are directions on how to proceed with the first round. Round 1 will be conducted using an online survey. Participation in this round should only require 15 minutes of your time. The responses from this round will be used to develop surveys for the subsequent rounds.

Please complete the online survey by October 24, 2014. We look forward to your input. Thank you again for agreeing to participate in this study.

Sincerely,

Beno Rubin
Beno Rubin
PhD Candidate, STEM Education & Professional Studies
Old Dominion University

John M. Ritz
John M. Ritz
Professor, STEM Education & Professional Studies
Old Dominion University

APPENDIX C

Round 1 Instructions & Survey

Purpose: Much of the research on program quality and standards has been focused on K-12 education and career and technical education. The current need for skilled labor has made trade and industrial programs increasingly relevant. The problem of this study is to develop program standards that can be used as a basis for establishing high quality postsecondary trade and industrial education programs. The results may be used to help postsecondary schools design and develop trade and industrial programs that serve specific labor markets.

A program standard differs from a skill standard in that skill standards defines the specific tasks the student will learn in relation to the industry. Program standards define the structure of the training program. **For this study, we are asking you for program standards, not skill standards.**

Definitions: The following are two definitions to assist you in your thinking about standard development.

- Standard - "descriptive statements established by key professionals and used as a model to assess the degree to which a program meets qualitative and quantitative characteristics of excellence" (American Industrial Arts Association, 1985, p. 8).

- Description of a Standard - "provides the foundation from which the standards are interpreted" or understood (National Center for Public Policy and Higher Education, 2009, p. 45)

Example of a Standard and Description: The Council for the Accreditation of Educator Preparation (CAEP) uses comprehensive standards to evaluate educator preparation programs. In 2010, CAEP used this standard, along with its corresponding description, to determine the effectiveness of a program's peer review process.

- Standard: *Peer Review*
- Description: *"A self-regulation process by which the quality of an institution, organization, Educator Preparation Provider (EPP), school, or other entity is evaluated by individuals who are active participants in the profession."*

Directions: To start the study, please go to the Survey Monkey website using the following link:

https://www.surveymonkey.com/s/9YMH65C

The first part of the survey will ask for demographic information, which will be kept

confidential. The second part of the survey will ask you to suggest two program standards including their descriptions that can be used for designing and assessing high quality postsecondary trade and industrial education programs.

Round 1 Survey

Thank you for participating in this study. This survey contains two sections. Please answer the questions in each section completely. The purpose of this survey is to provide input into the standards that can be used to determine a high quality postsecondary trade and industrial education program.

Part 1: Demographics

Which postsecondary trade and industrial education program(s) are you responsible? Please select all that apply.

- o **Architecture & Construction** (includes Carpentry; Construction Engineering; Electrical; Heating, Ventilation, & Air Conditioning (HVAC); Masonry; and Plumbing)
- o **Arts, A/V Technology, & Communications** (includes A/V Technology & Film; Journalism & Broadcasting; Performing Arts; Printing Technology; Telecommunications; and Visual Arts)
- o **Government & Public Administration** (includes Foreign Service; Governance; National Security; Planning; Public Management & Administration; Regulation; and Revenue & Taxation)
- o **Human Services** (includes Consumer Services; Cosmetology; Counseling & Mental Health; Early Childhood Development; Family & Community Services; Funeral Services; Massage Therapy; and Personal Fitness)
- o **Information Technology** (includes Information Support & Services; Network Systems; Programming & Software Development; and Web & Digital Communications)
- o **Law, Public Safety, Corrections, & Security** (includes Correction Services; Emergency & Fire Management; Law Enforcement Services; Legal Services; and Security & Protective Services)
- o **Manufacturing** (includes Health, Safety, & Environmental Assurance; Logistics & Inventory; Maintenance, Installation, & Repair; Manufacturing Production; Process Development; and Quality Assurance)
- o **Transportation, Distribution, & Logistics** (includes Aircraft Maintenance; Automotive Technology; Customer Service; Collision Repair; Diesel Technology; Environmental Compliance; Marine Technology; Logistics; Risk Management; and Warehousing)

Number of years as an administrator of trade and industrial education programs:

0 – 5 ___ 6 – 10 ___ 11 – 15 ___ 16 – 20 ___ 21 or more ___

Part 2: Standards

A program standard differs from a skill standard in that skill standards defines the specific tasks the student will learn in relation to the industry. Program standards define the structure of the training program. **For this study, we are asking you for program standards, not skill standards.**

Please list two program standards along with their descriptions that you believe can be used to design and assess high quality postsecondary trade and industrial education programs.

Standard 1:_____

Description:_____

_____

Standard 2:_____

Description: _____

_____

Thank you again for your participation. Your demographic information and your identity will be kept confidential. It will be used to define the expertise of the Delphi panel. The results of the survey will be reported in aggregate. You will be contacted by e-mail when the Round 2 survey is available.

(Note: This survey will be delivered electronically via Survey Monkey.)

APPENDIX D

Round 1 Standards and Descriptions

Standard	Description
85% of students enrolled in workforce programs will be retained from the first quarter of enrollment to the second quarter of enrollment	Of any starting cohort of students in any workforce program at least 85% will successfully transition from first term to second term.
Advisory committee is made up of industry reps from labor and management	In order to ensure that programs are relevant to today's economy, at least 50% of the committee needs to be from management (w/ hiring/firing capacity within their firms) and chaired by a management rep.
Connection with industry norms	Where applicable, course content should replicate and/or satisfy industry recognized credentials or oversight groups.
Contextualized learning	Student learning is conducted in an environment similar to the "real world" experience the student will enter upon completion of the program.
Curriculum and instructional planning	The program is properly designed to prepare students for entry into the occupation or trade.
Curriculum relevance	The program's curriculum should be based on task analysis of actual professionals working in that job.

Standard	Description
Demonstrate knowledge of content areas and familiarity with state Department of Education pre-kindergarten standards	Implies the program uses the current state standards to build a program and assess the student understanding of external standards.
Demonstrate knowledge of theories of human growth, development, and learning related to children, from birth to age eight.	The theory informs the curriculum and is woven throughout courses so that students provide the appropriate activities etc. for the children in the child care centers.
Demonstrated learning outcomes	Each course will provide an environment for the student to demonstrate the theory of the applicable subject matter.
Evidence-based teaching strategies	A method of teaching that incorporates recent research findings and "best practices" into the course of study
Gainful employment	Upon completion of the program, at least 90% of the students find gainful employment in an occupation directly related to the program in which they were enrolled.
Independent problem solving	Ability to come up with problem formulation, test problems, and test for solutions.
Industry credentials	The program content is consistent with industry credential requirements.
Industry recognized curriculum	What industry wants.

Standard	Description
Instructional faculty/staff	The instructional faculty/staff can proficiently and competently provide students with quality instruction for entry into the occupation or trade.
Instructors must have balanced technical and academic backgrounds	In order to ensure that teachers act as professionals, the system must require a balance of the following factors: no less than 9 years of certified field experience, no less than a Bachelor's degree from an accredited institution, and obtain the applicable state teacher's (lifetime/permanent) license.
Laboratory instruction	Laboratories should be equipped with the most current industry equipment and tools to facilitate learning. The required equipment and tools should be identified with the support of industry.
Promote teaching and learning excellence through the preparation and certification of educators.	Address the quality of professional and technical skills for Career & Technical Education (CTE) teachers by establishing high quality standards for preparing teachers, and requiring that teachers attain appropriate industry standards certification.
Qualified instructors	Instructors should have (as a minimum) an AAS in the field they are teaching and a minimum number of years practicing in the industry.
Soft skills	In addition to the technical skills related to completing specific tasks on the job, the program provides opportunities for students to master soft skills, such as punctuality, quality of work, communicating and collaborating with others, etc.
Team collaboration	Ability to know when to use a team for problem-solving or implementing solutions.

Standard	Description
Up to date equipment	Equipment used in field, current equipment.
Workforce program advisory committees rate the program graduates as "workforce ready"	In a structured survey of a program's advisory committee the aggregate average of questions answered indicating graduates are workforce ready will be at least 80%.

APPENDIX E

Review Board Request

November 3, 2014

Dear xxxxxxxx,

We are conducting a Delphi study that seeks to gain consensus on standards that can define a high quality postsecondary trade and industrial education program. These standards may be used in the creation of new programs or to improve existing programs. A panel of experts comprised of postsecondary trade and industrial administrators were asked to provide a list of standards with descriptions in the first round of this study. Their responses form the basis for subsequent rounds in this study.

As an expert in your field, we are seeking your assistance with this study. To eliminate potential researcher bias, a review board should be used to analyze and categorize the data from the first round survey. We are asking you to serve on this board along with two of your colleagues.

Participation to serve on this review board is optional. Your identities will not be revealed to the participants in the study. Additionally, you will not receive any direct personal benefit for your time. This task will require either one morning or one afternoon of your time during the week of November 17, 2014. You will review all the standards, along with their descriptions, provided by the panelists. Your group needs to identify similar responses and then categorize the standards. The goal is to create a singular list of standards based on the panelists' responses. You may also need to edit standards and descriptions so they work together.

Please consider participating in this study. Your time and effort would be greatly appreciated. If you decide to accept this invitation, please respond to Beno Rubin at brubi003@odu.edu no later than November 10, 2014.

Thank you for your consideration. We look forward to your reply.

Sincerely,

Beno Rubin
Beno Rubin
PhD Candidate, STEM Education & Professional Studies
Old Dominion University

John M. Ritz
John M. Ritz
Professor, STEM Education & Professional Studies
Old Dominion University

APPENDIX F

Round 2 Instruction Letter

January 6, 2015

Dear xxxxxxxx,

Thank you again for agreeing to participate in our study on Determining Program Standards for Establishing High Quality Post Secondary Trade and Industrial Education Programs. We appreciate your response to Round 1 of our study.

We have received your list of standards and their corresponding descriptions that you and you fellow panelists have developed. An independent, three-member panel of postsecondary administrators have reviewed the list and combined similar standards and definitions. Please respond via e-mail if you accept the current list or if you believe additional standards and definitions need to be added. If you have additional standards and definitions, please include them in your e-mail to brubi003@odu.edu.

Please respond by January 16, 2015. We look forward to your input.

Sincerely,

Beno Rubin

Beno Rubin
PhD Candidate, STEM Education & Professional Studies
Old Dominion University

John M. Ritz

John M. Ritz
Professor, STEM Education & Professional Studies
Old Dominion University

APPENDIX G

Round 3 Instruction Letter

February 16, 2015

Dear xxxxxxxx,

Thank you again for agreeing to participate in our study on Determining Program Standards for Establishing High Quality Post Secondary Trade and Industrial Education Programs. We appreciate your response to Round 2 of our study.

Attached to this email is the list of standards and their corresponding definitions that you and fellow panelists have reviewed in the previous round. The recommendations that were made by the panelists have been incorporated into the list. Please review this list and rate each standard as to the level of your agreement that the standard does define a high quality postsecondary trade and industrial education program. Send your completed form via e-mail to brubi003@odu.edu.

Please respond by February 28, 2015. We look forward to your input.

Sincerely,

Beno Rubin

Beno Rubin
PhD Candidate, STEM Education & Professional Studies
Old Dominion University

John M. Ritz

John M. Ritz
Professor, STEM Education & Professional Studies
Old Dominion University

APPENDIX H

Round 3 Survey

Determining Program Standards That Establish High Quality Postsecondary Trade and Industrial Education Programs

Rating the Program Standards for a High Quality Postsecondary Trade and Industrial Education Program

DIRECTIONS: The following is a list of collated standards and related definitions that you and your colleagues provided in Rounds 1 and 2. We ask you to rate your degree of acceptance for each of the standards using the form below. **PLEASE ONLY CHECK ONE BOX PER STANDARD.**

1. **Academic Integration**

   Academic integration should provide the same rigorous knowledge and skills in English and mathematics that employers and colleges expect, and to the extent practicable, be internationally benchmarked so that all students are prepared to succeed in a global economy.

   Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

2. **Advisory Committee**

   In order to ensure the program is relevant to industry, an advisory committee will make key recommendations regarding standards, critical competencies, technical skill attainment, assessments, facilities, and equipment. The committee will be comprised of applicable representatives from the community, local business and industry, national sponsors, and state and national accrediting bodies.

   Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

3. **Curriculum**

The program curriculum is designed to reflect the needs of industry and is subject to revision by the program advisory committee.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

4. **Employer Feedback**

The program utilizes feedback from employers regarding the effectiveness of the training students receive and uses this feedback for program improvement.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

5. **Faculty Qualifications**

Faculty should have as a minimum an Applied Associate of Science or equivalent degree in the field they are teaching and a minimum number of years practicing in the industry for which they teach. Faculty are recognized professionals in the field with appropriate industry certifications. They have expertise in delivering instruction that includes best practices and training evaluation. The faculty follow a professional development plan that is designed to improve their effectiveness. Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

6. Meaningful Employability

The program content leads to long-term employment at a family sustainable wage.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

7. Placement Rates

The program monitors the placement rates of their students to an acceptable level as determined by the advisory committee.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

8. Program Design.

Programs incorporate industry-recognized technical standards into their curriculum and training methods that are valued in the workplace, and are continually validated in collaboration with secondary, postsecondary, and industry partners. Programs should be designed with lattices and ladders for student advancement opportunities.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

9. Program Review

Programs will develop an annual written review process that will be used to assess program quality and performance and make recommendations for continuous improvement.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

10. Safety.

Safety is incorporated into all aspects of the program. Facilities and equipment will be regularly inspected in order to maintain compliance with applicable OSHA regulations. Instructors will complete OSHA safety training as per their industry. Safety is an integral part of the program curriculum.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

11. Soft Skills

In addition to the technical skills related to completing specific tasks on the job, the program provides opportunities for students to master soft skills, such as punctuality, quality of work, and communicating and collaborating with others.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

12. Student Achievement of Industry Credentials

The program prepares students to take and pass industry accepted certification and/or licensure exams.

Do you agree with that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

13. Student Advancement

For those students in a two-year program seeking a four-year deree, a determination will be made regarding their readiness to transfer to a four-year institution.

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

14. Student Assessment

Student assessments must determine each student's technical skill attainment to relevant industry standards. Students should also demonstrate mastery of academic skills attainment regardless of their chosen career area.

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

15. Student Remediation

Remediation structures are in place for students that are found needing help with being successful in the academic or technical courses.

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

16. Student Retention

A majority of students that begin a program will complete it.

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

17. Tools and Equipment

The laboratories are equipped with up-to-date tools and equipment that are based upon the recommendation of the advisory committee. The equipment should be representative of what is utilized in the industry.

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

Thank you for your continued time and support of this study. We appreciate your contributions. Please E-mail your completed survey to brui003@odu.edu by Friday, February 28, 2015.

APPENDIX I

Round 4 Instruction Letter

March 10, 2015

Dear xxxxxxxx,

Thank you again for agreeing to participate in our study on Determining Program Standards for Establishing High Quality Post Secondary Trade and Industrial Education Programs. We appreciate your response to Round 4 of our study, which will be the final round.

We have included the group mean, median, standard deviation, and interquartile range for each standard along with your responses from Round 3. After reviewing the data, please re-rate your degree of acceptance for each of the standards that will define a high quality postsecondary trade and industrial education program. Send your completed form via e-mail to brubi003@odu.edu.

Please respond by March 20, 2015. We look forward to your input.

Sincerely,

Beno Rubin
Beno Rubin
PhD Candidate, STEM Education & Professional Studies
Old Dominion University

John M. Ritz
John M. Ritz
Professor, STEM Education & Professional Studies
Old Dominion University

APPENDIX J

Round 4 Survey

Determining Program Standards That Establish High Quality Postsecondary Trade and Industrial Education Programs

Rating the Program Standards for a High Quality Postsecondary Trade and Industrial Education Program

DIRECTIONS: The following is a list of collated standards and related definitions that you and your colleagues provided in Rounds 1 and 2. We have included the group mean, median, standard deviation, and interquartile range for each standard along with your responses from Round 3. We ask you to re-rate your degree of acceptance for each of the standards after reviewing the data using the form below.

PLEASE ANSWER EACH QUESTION AND ONLY CHECK ONE BOX PER STANDARD.

1. Academic Integration

Academic integration should provide the same rigorous knowledge and skills in English and mathematics that employers and colleges expect, and to the extent practicable, be internationally benchmarked so that all students are prepared to succeed in a global economy.

Mean: 4.38 **Median**: 5 **Standard Deviation**: 0.87 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

2. Advisory Committee

In order to ensure the program is relevant to industry, an advisory committee will make key recommendations regarding standards, critical competencies, technical skill attainment, assessments, facilities, and equipment. The committee will be comprised of applicable representatives from the community, local business and industry, national sponsors, and state and national accrediting bodies.

Mean: 4.69 **Median**: 5 **Standard Deviation**: 0.48 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

3. Curriculum

The program curriculum is designed to reflect the needs of industry and is subject to revision by the program advisory committee.

Mean: 4.00 **Median**: 4 **Standard Deviation**: 1.08 **Interquartile Range**: 2

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

4. Employer Feedback

The program utilizes feedback from employers regarding the effectiveness of the training the students receive and uses this feedback for program improvement.

Mean: 4.69 **Median**: 5 **Standard Deviation**: 0.48 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

5. **Faculty Qualifications**

Faculty should have as a minimum an Applied Associate of Science or equivalent degree in the field they are teaching and a minimum number of years practicing in the industry for which they teach. Faculty are recognized professionals in the field with appropriate industry certifications. They have expertise in delivering instruction that includes best practices and training evaluation. The faculty follow a professional development plan that is designed to improve their effectiveness.

Mean: 4.23 **Median**: 4 **Standard Deviation**: 0.83 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

6. Meaningful Employability

The program content leads to long-term employment at a family sustainable wage.

Mean: 4.38 **Median**: 5 **Standard Deviation**: 0.96 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

7. Placement Rates

The program monitors the placement rates of their students to an acceptable level as determined by the advisory committee.

Mean: 3.77 **Median**: 4 **Standard Deviation**: 1.09 **Interquartile Range**: 2

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

8. Program Design.

Programs incorporate industry-recognized technical standards into their curriculum and training methods that are valued in the workplace, and are continually validated in collaboration with secondary, postsecondary, and industry partners. Programs should be designed with lattices and ladders for student advancement opportunities.

Mean: 4.54 **Median**: 5 **Standard Deviation**: 0.88 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

9. Program Review

Programs will develop an annual written review process that will be used to assess program quality and performance and make recommendations for continuous improvement.

Mean: 4.38 **Median**: 4 **Standard Deviation**: 0.65 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

10. Safety.

Safety is incorporated into all aspects of the program. Facilities and equipment will be regularly inspected in order to maintain compliance with applicable OSHA regulations. Instructors will complete OSHA safety training as per their industry. Safety is an integral part of the program curriculum.

Mean: 4.92 **Median**: 5 **Standard Deviation**: 0.28 **Interquartile Range**: 0

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

11. Soft Skills

In addition to the technical skills related to completing specific tasks on the job, the program provides opportunities for students to master soft skills, such as punctuality, quality of work, and communicating and collaborating with others.

Mean: 4.85 **Median**: 5 **Standard Deviation**: 0.38 **Interquartile Range**: 0

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

12. Student Achievement of Industry Credentials

The program prepares students to take and pass industry accepted certification and/or licensure exams.

Mean: 4.40 **Median**: 5 **Standard Deviation**: 0.48 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

13. Student Advancement

For those students in a two-year program seeking a four-year degree, a determination will be made regarding their readiness to transfer to a four-year institution.

Mean: 3.46 **Median**: 4 **Standard Deviation**: 0.88 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

14. Student Assessment

Student assessments must determine each student's technical skill attainment to relevant industry standards. Students should also demonstrate mastery of academic skills attainment regardless of their chosen career area.

Mean: 4.69 **Median**: 5 **Standard Deviation**: 0.48 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

15. Student Remediation

Remediation structures are in place for students that are found needing help with being successful in the academic or technical courses.

Mean: 4.31 **Median**: 4 **Standard Deviation**: 0.63 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

16. Student Retention

A majority of students that begin a program will complete it.

Mean: 4.23 **Median**: 4 **Standard Deviation**: 0.44 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	Agree	Uncertain	Disagree	Strongly Disagree
☐	☐	☐	☐	☐

17. Tools and Equipment

The laboratories are equipped with up-to-date tools and equipment that are based upon the recommendation of the advisory committee. The equipment should be representative of what is utilized in the industry.

Mean: 4.69 **Median**: 5 **Standard Deviation**: 0.48 **Interquartile Range**: 1

Your Round 3 Response: x (level of agreement)

Do you agree that this standard can identify a high quality postsecondary trade and industrial program?

Strongly Agree	**Agree**	**Uncertain**	**Disagree**	**Strongly Disagree**
☐	☐	☐	☐	☐

Thank you for your continued time and support of this study. We appreciate your contributions. Please E-mail your completed survey to brui003@odu.edu by Friday, March 20, 2015.

VITA

Beno Rubin

Darden College of Education
STEM Education and Professional Studies
Old Dominion University
Norfolk, VA 23529

Academic Degrees

M.S. NOVA Southeastern University	2004 Management and Administration of Educational Programs
B.S. Lehman College	1994 Computing and Management
A.A.S Westchester Community College	1992 Apprentice Training – Automotive, Toyota T-TEN

Professional Experience

2013 – Present	Tidewater Community College, Director, Regional Automotive Center
2007 – Present	National Automotive Technicians Education Foundation, Evaluation Team Leader
1996 – 2013	Tidewater Community College, Associate Professor of Automotive Technology
1999 – 2004	Virginia Beach Central Academy, Automotive Servicing Instructor
1995 – 1999	Charles Barker Lexus, Service Technician/Team Leader
1992 – 1995	Fordham Toyota, Automotive Technician
1991 – 1992	Toyota/Mazda of Greenwich, Automotive Technician

Certifications

Automotive Service Excellence, Advanced Engine Performance
Automotive Service Excellence, Master Automobile Technician
Automotive Service Excellence, Refrigerant Recovery License
Toyota Technical Education Network, Certified Instructor
Virginia Department of State Police, Virginia Safety Inspector

Awards

2014 - Byrl Shoemaker/Automotive Service Excellence Industry Alliance Instructor of the Year